

A KNOWLEDGE MANAGEMENT FRAMEWORK FOR IMPROVING EMERGENCY AND CRISIS RESPONSE IN ZIMBABWE

by

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Declaration

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Signed ..

Abstract

This study aimed to develop a Knowledge Management (KM) framework that will aid coordination and collaboration among the disparate emergency responders in Zimbabwe. The research employed a multi-theoretical approach, utilising the Actor Network Theory, Structuration Theory, and the 7S Model as both theoretical and analytical frameworks. This integration of complementary theories provided a robust and multidimensional lens to examine the complex dynamics of disaster response and KM. The study adopted critical realist ontology and epistemology. A case study approach was used using the Department of Civil Protection. The Design Science Research methodology was used together with the participatory action research. Multistage sampling techniques using purposive and convenience sampling were employed to identify the participants in this study. Interviews were used to collect the data and 26 interviews were conducted until data saturation was obtained. Data was analysed using ATLAS.ti.24. The following actions were identified as coordination mechanisms that the DCP is currently employing: the civil protection structure, how disaster information flows, how disaster knowledge is managed, capacity building, the adoption of the Incident Command System, the use of Memorandum of Understanding, the use of Standard Operating Procedures as well as debriefing and knowledge sharing. The barriers that were identified as hindering effective coordination and collaboration among responders were the structure of the DCP, the way disaster communication takes place, a low e-government uptake, a lack of resources, culture and poor disaster KM. The KM strategies that were recommended include developing a single disaster knowledge repository, investing in indigenous knowledge-based early warning systems, capacity building, adopting technologies in disaster response, engaging in partnerships for KM, governance and fostering a knowledge culture. The findings of the study resulted in the development of a novel KM framework that facilitates a more structured approach to disaster coordination. The framework is based on four interconnected components: knowledge capture and acquisition, knowledge storage, knowledge processing and analysis and, lastly, knowledge sharing, transfer and dissemination. The framework hinges on an information technology infrastructure backbone, supporting the KM cycle. The DCP can use technology to gather and capture disaster information and knowledge, store, process and analyse the information and also disseminate the information. However, technology alone does not guarantee effective emergency and crisis coordination. Supporting structures need to be in place, and these include: structure, leadership, change management and communication, capacity building, governance and compliance and monitoring and evaluation. The framework was validated using expert interviews.

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Dedication

This doctoral thesis is dedicated to my sons (Dion, Dervin and Dylan) who have been the driving force behind my pursuit of this academic endeavour. It is your encouragement, support, patience, understanding and the joy you bring to my life that has sustained me through the challenges and triumphs of this journey. Your unconditional love and steadfast belief in me have been the rock upon which I have built this academic achievement.

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Abbreviations /Acronyms

Actor Network Theory	ANT
After Action Reviews	AAR
Anticipatory Action Communities of Practice	AACoP
Artificial Intelligence	AI
Chief Knowledge Officer	СКО
Civil Protection	CP
Civil Protection Committee	CPC
Civil Society Organisations	CSOs
Command and Control	C2
Command and Control Centre	CCC
Communities of Practices	CoP
Community-Based Disaster Risk Management	CBDRM
Community Post-Disaster Reconstruction	CPDR
Complex Adaptive System	CAS
Decision Support Systems	DSS
Department of Civil Protection	DCP
Disaster Management	DM
Disaster Management Academics	DMA
Disaster Response Organisations	DRO
Disaster Risk Management	DRM
District Civil Protection Committee	DCPC
District Development Coordinator	DDC
District Water and Sanitation Committee	DWSC
Early Warning	EW
Early Warning System	EWS
Emergency Data Exchange Language	EDXL
Emergency Management Information System	EMIS
Emergency Operation Centre	EOC
Emergency Risk Communication	EMA
Environmental Management Agencies	ERC
Extensible Messaging and Presence Protocol	XMPP
Food and Agriculture Organisation	FAO
Humanitarian Country Team	HCT
Incident Commander	IC
Incident Command System	ICS

Indigenous Knowledge	IK
Indigenous Knowledge Systems	IKS
Information Communication Technology	ICT
Information Management	IM
Information Technology	IT
International Red Cross and Red Crescent	ICRC
Inter-Agency Standing Committee	IASC
Inter-Agency Working Group	IAWG
Key Performance Indicators	KPIs
Knowledge Assets	KA
Knowledge-Based View	KBV
Knowledge Management	KM
Knowledge Management Systems	KMS
Knowledge Sharing	KS
Knowledge Transfer	KT
Local Traditional Authorities	LTA
Ministry of Local Government Public Works and National Housing	MLGPWNH
Memorandum of Understanding	MoU
National Civil Protection Coordination Committee	NCPCC
National Disaster Response Framework	NDRF
Network Centric Operation	NCO
Non-Governmental Organisations	NGO
Organisational Learning	OL
Participatory action research	PAR
People Living with Disability	PwD
Provincial Civil Protection Committee	PCPC
Resource Based View	RBV
Rural District Council	RDC
Secretary for Provincial Affairs and Devolution	SPAD
Semantic Knowledge-based System	SKBS
Short Message Services	SMS
Situational Awareness	SA
Socialisation, Extermalisation, Combination and Internalisation	SECI
Standard Operating Procedures	SOPs
United Arab Emirates	UAE
United Nations	UN

United Nations Children's Fund	UNICEF
Village Head	VH
Ward Civil Protection Committee	WCPC
Water Sanitation and Hygiene	WASH
World Health Organisation	WHO

CHAPTER ONE INTRODUCTION

1.1 Introduction and background of the study

Each year the world is struck by disasters that threaten human security and welfare (Neville, Riordan, Pope, Rauner, Madden, Sweeney, Nussbaumer & Brien, 2016; Oktari, Munadi, K., Idroes, R., & Sofyan, 2020). However, responding effectively to such disaster is a major challenge for most nations (Wang & Wang, 2009). This problem occurs because responding to such a crisis involves a high demand for a critical mass of individuals and organisations such as the army, police, fire and non-governmental organisations, among other national entities that have different stakes in disaster recovery programmes. Thus, for a disaster to be dealt with effectively, it is important that there is effective sharing of relevant and reliable information between the citizens and the responders as well as amongst the responders (Bjerge, Clark, Fisker & Raju, 2016). According to Stanton, Salmon, Walker, Salas and Hancock (2017), effective information sharing does not mean the exchange of information with every emergency responder, it means timeous sharing of only the information that is of relevance to the emergency responder's role or function. Effective coordination and information sharing aid in the achievement of effective disaster response that was described by Waring, Alison, Carter, Barrett-Pink, Humann, Swan and Zilinsky (2018) as restoring normalcy as speedily as possible. This notion was supported by Usuda, Hanashima, Sato and Sano (2017) who argue that there should be effective sharing and unification of disaster information so that each emergency responder can guickly and efficiently respond to the disaster, ultimately maximising a nation's response capacity. Hameed, Naja, Cheeti, Sheokand, Mago and Desai (2020) have also called for an urgent need for close coordination and collaboration among crisis responders because pandemics such as the coronavirus, has pushed for effective information sharing within and across jurisdictional borders. However, Bjerge et al. (2016) observed that there is a dearth of information coordination and collaboration among responders that usually leads to overlapping initiatives and extensive resource mismanagement which ultimately leads to loss of lives and livelihoods.

Coordination has been described as the foundation for collaboration since the concept presents highest levels of trust, commitment and information sharing (Wankmüller & Reiner, 2019). Coordination means harmonising the various emergency response activities to eliminate duplication of services and gaps. Humanitarian coordination is used as a tool to achieve behaviour that is organised and produces desired outcomes such as efficiency, effectiveness and accountability in crisis response. Effective coordination leads to stronger

collaboration. Collaboration refers to the mutual sharing of information, being an art of working together jointly to achieve set goals within a given time frame. According to Wankmüller & Reiner (2019) there is need for high levels of coordination and collaboration amongst the emergency responders for efficient logistic processes to aid aspects such as transport, procurement and warehousing. Furthermore Abbasi and Kapucu (2016) note, however, that coordination in emergency response is complex and demanding because it creates intense time pressure and urgency. Coordination has been identified as a critical failure factor to effective response to large-scale crises and disasters.

In disaster situations, the ability of responders to quickly react to a crisis depends on the quality and nature of information at their disposal, and the extent to which they understand the current situation (O'Brien, Read & Salmon, 2020). Unfortunately, this information is not always readily available because the data is widely scattered and integrating the heterogeneous sources of information is difficult. Another barrier to organized information sharing in the disaster management (DM) sector is the availability of vast amounts of information that is sometimes not relevant to the stakeholder's requirements at that time (Bjerge et al., 2016), and a lack of professional knowledge of DM. Inter-organisational collaboration in a disaster, thus, is complex because catastrophic disasters can putatively prompt the creation of new networks of actors such as local and global humanitarian actors. In this setup, effective coordination, communication and sharing of information and knowledge is essential because the parties involved share ideas, experience and knowledge to attain the collective vision. Information communication technology (ICT) has the potential to address these challenges in humanitarian information management, thus, improving coordination.

There is general agreement in related literature that ICT plays a very pivotal role in information coordination and collaboration in all stages of the DM process (Mohan & Mittal, 2020; Shaw, 2021). There is a need to create a flexible information infrastructure that manages the dynamic information exchange among the various emergency responders. For this system to be effective, it must be capable of timeously disseminating the relevant information to the appropriate party in the right format to support prompt decision making (Stanton et al., 2017). It is argued in this research study that knowledge management (KM), due to its multidisciplinary nature, can provide the necessary interconnectedness of these diverse organisations that are responsible for responding to disaster as well as to the affected communities. Oktari, Munadi, Idroes and Sofyan (2020) points out that due to lack of coordination and collaboration in DM, disaster knowledge and experience remain at an individual and institutional level, thus, information on DM strategies is fragmented. This situation negatively affects the responsiveness of organisations to disaster, leading to

'reinventing the wheel' in projects and programme management. KM within the DM context focuses on availing the correct knowledge to the right people in the exact place at the correct time. Therefore, KM presents a possible environment for addressing the aforementioned limitations. The purpose of this chapter is to provide an overview of the problem of crisis coordination in the Zimbabwean context and the proposed solution to address this situation. The background of the problem is given as well as the objectives of the study. Figure 1.1 below gives the reader a roadmap of the chapter.



Figure 1.1: Chapter outline Source: Author

1.1.1 Background to the research context

In Zimbabwe, the government ministry responsible for disaster coordination is the Department of Civil Protection (DCP) that is under the Ministry of Local Government Public Works and National Housing (MLGPWNH). This mandate is achieved through the National Civil Protection Coordination Committee (NCPCC) that plays a leading role in informing the overall framework for the coordination, execution and promotion of DM in Zimbabwe. There are also both the Provincial Civil Protection Committee (PCPC) and the District Civil Protection Committee (DCPC) composed of representatives from various sectors. Whenever there is a disaster of great magnitude, the MLGPWNH's DCP, led by the District Development Coordinator (DDC) is activated in that district to protect and assist the affected persons or those people likely to be affected by the disaster. A multisector approach is used whereby various organisations jointly respond to the disaster.

Natural disasters have become recurrent and more destructive in Zimbabwe. The researcher contends, therefore, that it is important that lessons be learnt from past disasters so as to improve responses to future disasters. Floods have become one of the major disasters in Zimbabwe. In 2000, Zimbabwe was hit by Cyclone Eline that resulted in more than 250 000 people being marooned, 90 dead and roughly US\$7.5 million in financial losses. In March 2019, Zimbabwe was hit by the worst natural disaster, cyclone Idai, an event that was characterised by heavy rains, mudslides and flooding. Cyclone Idai destroyed infrastructure and marooned thousands of people, left hundreds of people dead and hundreds more unaccounted for. The cyclone also overwhelmed the government leaving it with little resources to respond to the crisis. COVID-19 also affected the country. In all these disasters, the country activated its crisis coordinating organ, the DCP, to coordinate the emergency response. Unfortunately, this point of reference for DM was incapacitated to carry out the coordination role for such catastrophic disasters, specifically cyclone Idai. One major challenge identified in cyclone Idai was access to information to express the type of humanitarian assistance required. Several individuals, humanitarian actors and organisations that entered the affected provinces could not attain relevant, timely information from DCP to assist them in responding effectively to the emergency (Christian Blind Mission, 2019). Thus, information sharing was ineffective because various responders could not access the relevant information that would have assisted them in making prompt sound decisions. This scenario contradicts the views of Stanton et al. (2017) who define effective information sharing as the timeous sharing of only the information that is of relevance to the emergency responder's role or function.

During Cyclone Idai, transporting the right supplies to the victims was a daunting task. The affected populations suffered because their critical needs could not be satisfied on time, while non-priority items arrived at the disaster sites. This processing and delivery of wrong supplies added to the congestion of transport, distribution nodes and overwhelmed warehouses that stored the donated goods, some of which expired while in the warehouses. This situation resulted in what is known as "the second crisis", i.e., the flooding of inappropriate donated materials to disaster areas. There was a lack of identification of essential information, such as when the various stakeholders needed specific supplies. The appropriate coordination and collaboration of emergency responders could have avoided this wasteful duplication and victim needs could have been fulfilled timeously. These problems could have been avoided as pointed out by Usuda et al. (2017) who stress the importance of effective sharing and unification of disaster information. Such a practice ensures that each emergency responder can quickly and effectively react and, thus, maximise a nation's response capacity and reduction in loss of lives and livelihoods (Bjerge et al., 2016).

The lack of effective coordination and collaboration by DCP can have a significant negative impact, especially on low-income households in the country. As observed by Hallegatte, Vogt-Schilb, Bangalore and Rozenberg (2017), the impact of ineffective DM can range from property damage, physical damage and financial impact to homelessness. Hence, natural disasters have continued to make it more likely that poor people will remain impoverished, thus leading to the vicious poverty cycle, especially for developing countries such as Zimbabwe. Effective coordination and collaboration in crisis response can be proffered through the utilisation of KM resulting in the reduction of the poor service provided to the affected communities.

1.2 Research problem

Against the background described above, this research study, therefore, sought to address the following problem:

There is a lack of coordinated information and knowledge regarding natural disasters and emergencies, which undermines collaboration among various responding organisations. This disconnection among actors results in slow decision-making processes and prolonged response times, ultimately hindering the effectiveness of disaster response efforts and exacerbating the vulnerabilities faced by affected communities.

While some frameworks address aspects of coordination and collaboration, few comprehensively integrate KM principles to enhance information sharing and collective action among diverse responders. For instance, Zainol et al. (2023) developed a framework aimed at measuring community disaster awareness and preparedness, guided by the Theory of Planned Behavior, which emphasises the role of attitudes, social norms, and behavioral control in shaping responses to disasters. Similarly, Grolinger et al., (2013) proposed a framework for managing disaster-related data using cloud computing and NoSQL technologies, focusing on interoperability and robust data storage solutions to facilitate seamless data access among stakeholders. Additionally, Badarudin et al. (2017) utilised data mining processes for rainfall prediction to mitigate hydro-meteorological disasters in Brunei, integrating expert knowledge and satellite data while employing the CRISP-DM methodology for systematic data analysis.

Despite these contributions, existing frameworks predominantly adopt a disciplinary approach and or focus on single aspects of the KM lifecycle. However, given the complex and multifaceted nature of disasters, there is a pressing need for a transdisciplinary approach that integrates diverse perspectives, knowledge, and skills from various fields to foster a more cohesive and effective disaster response strategy that improves the outcomes for the affected populations. This gap in the literature highlights the urgent need for a robust KM framework specifically tailored for disaster management that not only facilitates effective communication and collaboration but also adapts to the dynamic nature of disaster scenarios.

1.3 Research aims and objectives

1.3.1 Aim

The study aimed to develop a KM framework that would aid coordination and collaboration among the disparate emergency responders in Zimbabwe.

1.3.2 Objectives

- 1. To examine current coordination mechanisms and collaboration practices employed by DCP in emergency response.
- 2. To identify the potential barriers to effective coordination and collaboration amongst the emergency responders in Zimbabwe.
- 3. To recommend key KM strategies that DCP can implement to ensure effective coordination and collaboration among emergency responders in Zimbabwe.
- 4. To propose a KM framework that will improve coordination and collaboration among emergency responders in Zimbabwe.
- 5. To validate the KM framework by testing its usefulness and appropriateness for emergency responders.

1.4 Research question

The main research question is:

What are the key constructs that guide the development of a KM framework to improve coordination and collaboration among emergency responders in Zimbabwe?

Central to this main question are the following sub-questions:

- 1. What are the current coordination mechanisms and collaboration practices employed by DCP?
- 2. What are the potential barriers to effective coordination and information sharing among emergency responders?

- 3. What key KM strategies can DCP implement to ensure effective coordination and collaboration among emergency responders in Zimbabwe?
- 4. What are the key constructs that guide the development of a KM framework to improve coordination and collaboration among emergency responders in Zimbabwe?
- 5. How well will the proposed KM framework address the problem of the lack of coordination and collaboration in emergency response?

1.5 Significance of the study

It is anticipated that the findings from this study will be beneficial to several stakeholders:

Government ministries responsible for crisis response coordination: This research study designed an implementable knowledge based solution (based on IT infrastructure) that should ensure timeous sharing and visualisation of the information that is relevant to the specific emergency responder's function and, hence, support its prompt decision making. This has the potential to significantly improve crisis coordination and collaboration and, ultimately, the effectiveness of the response effort.

Emergency Responders: The implementable KM framework enhances the emergency response capabilities of NGOs, government, experts and all stakeholders involved in emergency response. This framework provides these responders with the relevant information that they need to make decisions.

The ordinary citizens: The KM framework leads to emergency responders' faster response to crises. This practice helps affected communities by saving lives and property since the nation's emergency response team will be more agile, robust and effective.

AU-African Union: The KM framework is a step towards a comprehensive 'homegrown' African response that is needed to address problems affecting Africa. It is of significance to the African Union Commission, member states, the regional economic blocs and African citizens because it acts as a strategy to improve the current African system in preparing and dealing with natural disasters, as well as the process towards recovery from such incidents.

Academia: Despite the existence of a knowledge economy in which knowledge is the basis of competitiveness for organisations, KM is still in its infancy in the academic field and few universities in Southern Africa offer it as a 'standalone' course. This research study advocates for the introduction of KM courses in Zimbabwean universities. The KM framework can help

leaders in the academic field craft content for a KM course that prepares students for dealing with the information and knowledge challenges affecting organisations. Such a practice will also augment the body of knowledge on KM, which is a fairly new and, thus, under-researched concept, especially in government.

1.6 Overview of thesis structure

The final thesis emanating from the research comprises nine chapters that focus on the following areas:

Chapter One: Introduction

This chapter presents the introduction and background to the study. The research problem is clearly articulated and the research objectives outlined. Other issues discussed in this chapter include the significance of the study. The last section of the chapter contains an overview of the thesis structure.

Chapter Two: Disaster Management and Coordination

This chapter provides a comprehensive analysis of literature that addresses the study's research objective 1: To examine current coordination mechanisms and collaboration practices employed by DCP during emergency response. It also addresses research objective 2: To identify the potential barriers to effective coordination and collaboration amongst the emergency responders in Zimbabwe. The chapter begins with an overview of DM and then explores the structure and role of the Incident Command System (ICS). The final section examines the formal and informal processes, practices, manners, techniques and systems used to achieve crisis coordination (collectively known as the coordination mechanisms) that are established to resolve crisis coordination issues, as well as the barriers to effective coordination.

Chapter Three: Knowledge Management and ICTs for Emergency and Crisis Response

This chapter undertakes a comprehensive literature review to address research objective 3 which primarily focuses on proposing effective KM strategies for promoting coordination and collaboration among emergency responders in Zimbabwe, particularly within the context of crisis response scenarios. The central research inquiry focuses on identifying KM strategies capable of augmenting crisis coordination and collaboration. The chapter reviews the literature on the knowledge-based view comprising an overview of the KM life cycle and how to leverage ICT to enhance the KM lifecycle. The various KM frameworks and strategies for crisis response are reviewed. A conceptual framework is presented, followed by a chapter summary.

Chapter Four: Theoretical Underpinnings

The theoretical frameworks underpinning the study – the Actor Network theory, the Structuration theory and the 7S McKinsey model – are discussed in this chapter.

Chapter Five: Research Philosophy and Methodology

This chapter presents the essential elements of the research and offers justification for the diverse array of decisions made when opting for the foundational philosophical approaches that underpin this investigation. The initial segment delves into the researcher's inherent embracement of ontological and epistemological viewpoints. These viewpoints subsequently mold the researcher's selection of research methodologies. The examination of the research paradigm ensues, accompanied by a discourse on the methodology and the reasoning behind each choice. Moreover, the chapter tackles subjects such as population and sampling techniques and provides an in-depth explanation of the methodology for data collection and the techniques for data analysis that are employed in this study.

Chapter Six: Data Analysis and Presentation

This chapter presents the research findings. The chapter initially describes the analysis process and the findings in relation to the research questions. It answers research question 1 "What are the current coordination mechanisms and collaboration practices employed by DCP?", research question 2 "What are the potential barriers to effective coordination and information sharing among emergency responders?', research question 3 "What key KM strategies can DCP implement to ensure effective coordination and collaboration among emergency responders in Zimbabwe?". The chapter synthesises all the research findings using the Actor Network theory, Structuration theory and the 7S McKinsey Model to identify key constructs that guide the development of the KM framework. Thus the chapter also answers research question 4 "What are the key constructs that guide the development of a KM framework to improve coordination and collaboration among emergency responders in Zimbabwe?".

Chapter Seven: Discussion of Findings

This chapter discusses the research findings presented in Chapter 6. In addition, it examines the theoretical, practical and empirical significance of these findings, highlighting their potential implications for future research, policy and or practice as well as possible reasons for their alignment or contradiction with prior literature.

Chapter Eight: Framework Development and Validation

This chapter integrates the key KM constructs identified in Chapter 6 to develop a KM framework. It also discusses how the framework will be evaluated and the methods used for its validation. This chapter therefore answers research question 4: "What are the key constructs that guide the development of a KM framework to improve coordination and collaboration among emergency responders in Zimbabwe?" and research question 5: "How well will the proposed KM framework address the problem of the lack of coordination and collaboration in emergency response?".

Chapter Nine: Conclusions, Contributions and Limitations

This chapter contains the conclusions drawn from the study. Its contribution as well as its limitations are then discussed.

1.7 Chapter summary

This chapter provided an overview of the problem that motivated this research study. The issue of crisis response in Zimbabwe together with the lack of coordinated information and knowledge was discussed. The chapter set the tone for the research and discussed the research problem, research objectives and the research questions. The final section gave an outline of the whole thesis.

CHAPTER TWO

DISASTER MANAGEMENT AND COORDINATION

2.1 Introduction

The major purpose of the literature reviewed in this chapter is to comprehensively analyse two broad questions. First: "What are the coordination mechanisms and collaboration practices employed by emergency responders?" Second: "What are the barriers to effective coordination and collaboration amongst emergency responders?". These two broad questions seek to theoretically address this study's research objective 1: "To examine current coordination mechanisms and collaboration practices employed by DCP in emergency response", as well as research objective 2: "To identify the potential barriers to effective coordination and collaboration amongst the emergency responders in Zimbabwe". Figure 2.1 below provides the road map for this chapter.



Figure 2.1: Chapter outline

Source: Author

2.2 Disaster management overview

This section presents an overview of Disaster Management (DM). It commences with an overview of the disaster situation, followed by definitions of disaster and DM. Lastly it discusses the requirements for effective DM.

2.2.1 Disaster situation overview

DM involves many organisations and joint decision-making activities that are frequently characterised by a high degree of complexity concerning different knowledge sources dispersed across space, time and people (Ali, Mohammad, Ahmad & Hidayati, 2015). In emergency/crisis response, the humanitarian community requires a vast variety of information related to the situation on the ground, such as the availability and movement of all relief supplies and expertise, disease surveillance, population displacement and meteorological satellite maps or images. Hernandez-escobedo (2015) noted that different organisations require different information, for example donor organisations may require information related to trends in disaster and the needs of the victims. Aid workers may require information. In all emergency operations, it is crucial to collaborate by timeously sharing accurate, relevant and comprehensive information (Zhang, Zhou & Nunamaker, 2002), thus, effective DM is needed to save lives and infrastructure.

2.2.2 Disaster and DM definition

Disaster: A disaster is an unanticipated event that is frequently abrupt. It results in significant destruction, damage and human distress (Ali et al., 2015). This situation usually exceeds the capabilities of the local response and results in the need for external aid from national or international sources. A disaster can be either a sudden or progressive natural or man-made event whose impact is such that the affected community must respond through exceptional measures. FEMA (2004) defines a disaster as an occurrence of a technological accident, natural catastrophe or humanly-caused event that results in severe damage to property, multiple injuries or even death. A disaster can exceed the response capabilities of the local jurisdiction, requiring national or international involvement. According to Bunker, Levine and Woody (2014), disaster occurs through different media (land, air and/or water) and has different agency types (natural activities or explosions), lead times to warnings, lapsed time to their full effect, magnitudes, amplitudes, size covered and impacts to society and environment

While all the definitions above agree on the general concepts of disaster, they offer some differences. For example, all the definitions acknowledge that a disaster can be an unanticipated man-made or natural event that it is destructive and causes damage and human suffering. All the definitions concur that disaster can exceed the response capabilities of the

local jurisdiction and, hence, may require the interventions of external parties and even exceptional measures to cope with the impact. However, the authors define disaster from distinct perspectives. For example, FEMA specifies technological accidents, human-caused events or natural catastrophes in contrast to the other authors while Bunker et al. (2014) delved into detailed characteristics such as the different media through which disaster occurs.

Disaster Management (DM): DM involves planning for and being prepared to effectively deal with unexpected disasters when they occur (Asamoah, Akussah & Musah, 2018). DM refers to the planning, organisation and application of measures meant to prepare for responding to and recovering from a disaster, it aims at lessening the impact of disasters, thus, minimising loss of life and property (Oktari et al., 2020). Modh (2010) defines DM as dealing with resource and information management (IM) during a disastrous event and is measured by how effectively, efficiently and seamlessly these resources are coordinated. This definition was adopted in this research study because it emphasises the critical aspect of IM in disaster situations and highlights the need for and importance of effective coordination. There is a consensus that DM involves a proactive approach that entails coordinating actions during and after the event. The cited authors concur that the aim of managing disaster is to minimise losses.

2.2.3 Requirements of effective DM

Disaster response falls into three phases as shown Figure 2.2 below. The pre-crisis phase that focuses on collecting and updating of data related to disaster. The second phase is the crisis phase that deals with information exchange among the various emergency responders, disseminating information on demand, coordinating operational resources and assistance planning. The last phase is the post crisis phase that focuses on improving the response to future crises by summarising the lessons learned and proposing adjustments to existing tools and methods (Qadir, Ali, ur Rasool, Zwitter, Sathiaseelan & Crowcroft, 2016).



Figure 2.2: Disaster management phases Source: Qadir et al. (2016)

This research focused mainly on the crisis response phase that deals with information exchange among the responders. However, for information to be shared it has to be available in the first place through the preparedness phase. DM is not the function of any one organisation and, thus requires the cooperation, collaboration and coordination of professionals, experts and agencies (Asamoah et al., 2018). In responding to a disaster, heterogenous responders, in terms of their specific operational expertise, background and professional language, organise their actions across institutional and jurisdictional borders in a coordinated fashion for a timely and efficient response operation. Disaster response is a joint responsibility that requires a coordinated response from all parts of society. It involves bringing together diverse groups of responders requiring extraordinary coordination and management of resources, people, approaches and facilities. Responding to crises includes actions taken before and during the crises and requires urgent action and a coordinated application of facilities, resources and efforts. Thus, effective coordination plays a significant role in the success or failure of a crisis response effort. Failures in disaster response have been largely attributed to the malfunctioning of coordination and communication (Boin & Lagadec, 2000). There is general agreement amongst the findings from the reviewed literature that better coordination, which is defined as the alignment of methods and goals across the emergency responders, creates better outcomes (measured in more rapid food delivery and medical services, lower mortality rates and less waste (Siembieda, 2012). Effective coordination has been identified by various emergency responders as an important ingredient in emergency response strategies (Upadhyaya, 2008). This view supports that of Thompson, (2006) who identified a lack of coordination, poor information management and failure to make prompt decisions as barriers to effective disaster response efforts.

Shokr, Jolai and Bozorgi-Amiri (2022) observed that NGOs have been playing a significant role in responding to crisis situations across the globe. However, there has been limited success in terms of coordination amongst these emergency responders. Despite the tenacious urgency of effective response to disaster, the conditions under which emergency responders coordinate well during the disaster still remain vague (Aldrich, 2019). Thus, it can be argued that communication, collaboration and coordination are critical factors in disaster response because better coordination leads to better outcomes. The next subsection, therefore, reviews literature that focuses on crisis coordination.

2.3 Organisational theory in disaster management

The optimal configuration of emergency management systems includes the integration of public, private and non-profit organisations. The aim of this section was to discuss the different organisational structures that result in improved coordination and, hence, enhanced disaster response. Knowledge gained from this review informed the development of more resilient, effective and collaborative DM systems.

2.3.1 Organisational structures in disaster response

The way different groups and organisations are set up and connected to work together during an emergency is described as the structure of the organisation (Lee, Bae, Oh, Hong & Moon, 2015). According to Simpson (2012), organisational structure refers to how an organisation is organised, including how responsibilities, roles and communication path are designed. Similarly, Manyoma, Reyes & Bohorquez (2019) define organisational structure in disaster response as how the teams work together, how they are organised and how they make decisions during emergencies. Thus, it includes the teams' decision-making rights, information distribution, team member roles and their interactional patterns. For effective disaster response, a well-defined organisational structure is needed because it helps stakeholders share information, coordinate actions and allocate tasks efficiently. Clearly defined roles, responsibilities and authority within the structure ensure that each member knows their position (Manyoma et al., 2019). Clearly defined communication channels also allow for swift and effective responses due to the timely flow of information (Celik & Corbacioglu, 2018). However, during emergencies, the structure may adapt to the evolving situation. This ability to modify the structure according to the requirements of the situation enhances the effectiveness of the disaster response effort (Manyoma et al., 2019). According to Celik & Corbacioglu (2018), understanding how the structure of an organisation impacts disaster response is crucial in designing effective and efficient response systems.

This opinion concurs with that of Abbasi, Sadeghi-Niaraki, Jalili and Choi (2018) who argue that understanding the fragmentation and connectedness of a network helps to prevent disconnectedness from other actors in the network. This improves the effectiveness of the DM procedures through enhanced information flow among the disaster response participants (Abbasi et al., 2018). The provision and sharing of information timely in emergency response is crucial for decision-making because it boosts situational awareness. According to Abbasi et al. (2018), it is important to understand the network characteristics and structures that are associated with effective response in emergencies. This knowledge will help to ensure the application of appropriate coordination mechanisms that are a necessity for facilitating communication among the different parties involved in the response operation (Abbasi et al., 2018).

2.3.2 Types of organisational structures

2.3.2.1 Hierarchical, distributed, hybrid and networked

Different types of organisational structures exist and each has its 'pros' and 'cons' and its applicability in disaster situations differs. According to Brugh, Sorokin and Bar-Yam (2015), hierarchical, distributed, hybrid and networked structures exist. A hierarchical structure provides clear lines of command, decisions, instructions and top-down information flow that provides structure and a sense of order. However, due to the need for approval at each decision level, decision making can be slow and agility and adaptability is limited. As such a hierarchical structure has limitations in responding to complex dynamic environments (Brugh et al., 2015).

The distributed structure dispenses power and decision making among the various parts of the organisation (Brugh et al., 2015). There is no single group or individual responsible for everything but groups or individuals make decisions related to their roles and situations. There is direct communication among the different sections allowing the smooth and efficient flow of information. Decision-making is a collaborative process. Compared to the hierarchical structure, the distributed structure responds more rapidly to different needs because waiting for approval from the central authority is unnecessary. This practice makes the organisation agile, flexible, innovative and able to adapt to new challenges (Brugh et al., 2015). However, without a central supervisory structure, clear protocols and guidelines, ensuring accountability and maintaining consistency maybe challenging. Conflict resolution among responding organisations can also be a problem without a central arbitrator.

A hybrid structure combines aspects of a centralised and decentralised system (Brugh et al., 2015). Within this structure, some parts of the organisation operate with a centralised approach for consistency while other parts operate in a decentralised manner that allows them to be responsive and tailor their decisions to local circumstances and needs. This blend maximises the strengths and minimises the weaknesses of each unit (Brugh et al., 2015). However, according to Brugh et al. (2015), implementing this structure requires organisations to strategically assess units that can benefit from centralisation and those units that can benefit from decentralisation. The organisation should also put in place clear channels of communication as well as regular evaluations and adjustments of the hybrid model to optimise performance.

2.3.2.2 Centralised, closed, decentralised and core-periphery

A networked structure refers to the global configuration of the whole network (Provan, Fish & Sydow, 2007). Networked structures play a crucial role in emergency response because they determine the flow of resources, information and coordination among various actors involved in emergency response. According to Branda, Toddi, Velez and Zheng (2018), significant debate exists regarding the most appropriate governance structure for responding to emergencies. In designing systems for effective emergency response, it is important to understand the various network structures, as well as their capabilities and limitations. There are four prominent structures of whole networks: centralised, closed, decentralised/brokered and core-periphery network structures (Branda et al., 2018) as shown in Figure 2.3 below. Each has its advantages and disadvantages as discussed below. However, there has been limited theoretical development concerning which structure will lead to more capable, scalable, and responsive disaster response networks (Nowell & Steelman, 2015). However, Branda et al., (2018) argue that an ideal structure is neither rigidly centralised nor highly integrated but rather is characterised by a moderate core–periphery structure.



Figure 2.3: Network structure Source : Branda et al. (2018)

Centralised structures: It is the central coordinating agency's responsibility to establish the protocol for information collection, storing, distributing and sharing. With a centralised structure, members are linked together exclusively through their connection to a single centralised actor (Branda et al., 2018). The Incident Commander (IC) who governs incident response holistically is grounded in this type of structure in which various agencies bring together resources under the centralised command and control (C2) of a single IC. According to Turrini, Cristofoli, Frosini and Nasi (2010) when networks are large and members are united by a common goal and trust in each other, the centralised network becomes advantageous. However, the pertinence of this structure in dynamic environments has been criticised by many academics. For example, network functionality collapses if the crisis setting overwhelms the central hub's capacity and it lacks scalability in dynamic contexts (Comfort, Wang & Cigler, 2012; Hollenbeck, Ellis, Humphrey, Garza and Ilgen, 2011). The centralised structure is also unable to coordinate across lateral relationships (Carroll, Cohn, Seesholtz & Higgins, 2005; Carroll, Higgins, Cohn & Burchfield, 2006; Paveglio, Higgins, Cohn & Burchfield et al., 2015). However, other researchers such as Lin, Zhao, Ismail and Carley (2006).are against the centralised top-down command and control model because information has to move rapidly across many sources. They argue that the model is too slow to meet the needs of crisis information dissemination. A centralist incident command system and structure creates serious challenges. Lin et al. (2006) further explains that such a structure becomes a grave problem especially when the executives can hardly comprehend the quantum of the complexity. In complex uncertain environments the cluster approach, that is a more decentralised intervention system, is supported in global humanitarian response systems. According to Stumpenhorst & Stumpenhorst (2011), the cluster approach comprises clustered actors' coordination. These clustered actors have different responsibilities during emergence response, for example health, agriculture and shelter. This method, however, can create conflict and overlapping of aid because big organisations can commit themselves to more than one membership cluster.

Network Centric: The network centric structure has been classified as the most appropriate and efficient system in terms of accuracy, speed, knowledge sharing, information distribution and decision making in complex environments compared to the hierarchical method (Panayiotis et al., 2017). For complex, dynamic and time dependent operations such as disaster response, network centric warfare is the most appropriate, based on extensive use of IM and IT and, even more importantly, the increasing use of KM techniques (Panayiotis et al., 2017). However, the network centric structure has some shortcomings such as challenges in information quality validation due to information overload. Another challenge is that the effectiveness of this system is dependent on the formulation of new roles and organisational policies regarding information sharing.

Decentralised/brokerage network structure: These structures are characterised by the presence of subgroups connected to each other through a series of brokers (Branda et al., 2018).

Core-periphery network: This network is characterised by dense connections among a central subgroup of actors at the network core, surrounded by a peripheral set of actors with more sparse connections. In a core-periphery structure, the network is unified, it cannot be easily divided into multiple structurally independent subnetworks. Network actors within the network, however, differ from each other in their structural embeddedness to the network. The core-periphery structure is theoretically thought to have an advantage over fully centralised structures, especially in dynamic environments that are complex to manage effectively through a fully centralised control system but still require active coordination and communication among subgroups (Cummings & Cross, 2003;Provan & Lemaire, 2012). However, the core-periphery structure's design has been criticised because it limits the network's ability to solve non-routine complex tasks since it tends to marginalise peripheral members' contributions (Cummings & Cross, 2003).

2.3.2.3 Incident Command System overview

The ICS is a specific organisational structure and decision-making framework that was designed to enhance the coordination and effectiveness of disaster response. It is a unified management system for incidents that was developed in the United States as a response to the recurring problems and challenges during the multi-agent response to California wildfires (Sederholm, Ekman, Paakkonen & Huhtinen, 2021). Initially, the model was roughly based on military models of command and control. This original structure has been further developed but the basic concept remains the same. The United States ICS has been applied by different countries around the globe in their ICSs and has since become the cornerstone of DM (FEMA, 2017).

According to Andreassen, Borch and Ikonen (2019), despite the importance of communication and effective coordination between various stakeholders during large-scale operations, this practice is challenging. This problem arises because the involved organisations may be using different command structures and employing different coordination mechanisms. The ICS is established to facilitate coordination, leadership and information flow among the multiple
emergency responders participating in the response effort (Cruz, Hawk, Poulet, Rovira & Rouse, 2015; Rimstad, Hawk, Poulet, Rovira & Rouse, 2014). It helps to avoid the overwhelming of a single department or individual by spreading the workload across many stakeholders. Coordination is achieved by proper definition of managerial responsibilities, roles and information flow between organisations and individuals participating in the crises response (Andreassen, Borch & Sydnes, 2020a). The various response stakeholders, however, should be interconnected with a common goal (Cruz et al., 2015; Farcas, Ko, Chan, Malik, Nono & Chiampas, 2021). The main role of an ICS is to reduce confusion regarding responsibilities and authorities, and ensure effective resource allocation. It offers a unified approach that affords full cooperation between the various stakeholders. The common framework and language provided by ICS allow responders from different jurisdictions and agencies to work together seamlessly. This integrated approach ensures effective and rapid response to emergencies leading to better outcomes for both the affected communities and the responders. Within the ICS, each agency is responsible for sharing its agency-specific information such as resource availability, limitations and conflict (Farcas et al., 2021). Thus, organisations that use the ICS model for DM adopt predefined management processes, hierarchy and protocols that come into play in an emergency and provide a common hierarchy within which responders from various organisations can be effective (Farcas et al., 2021).

Each disaster situation results in the formation of an incident organisation that is a temporary configuration of resources drawn from many agencies. Within the incident organisation, the people, distributed technologies and procedures concerned with directing the resources can be identified collectively as a DM system. Often, the team does not formally exist until a disaster occurs. It is important to understand the essential characteristics of an ICS to adapt its use to all hazardous environments. According to Sundnes (2014a), a coordination and control centre has the following roles and responsibilities: planning, maintaining inventories, defining overarching goals and objectives of interventions and applying appropriate indicators of effectiveness and efficiency. In addition, a disaster coordination and control centre should ensure data and information management. This practice is essential because sound decisionmaking relies heavily on accurate information. The coordination and control centre may accumulate voluminous amounts of data although various personnel may require only specific parts of that information. A system that facilitates the conversion of the collected data into information for decision-making by the various responders is needed. This IM system should also be available, tested and refined before a catastrophic event occurs (Sundnes, 2014a). The CCC should exercise authority to control all aspects of the DM through the maintenance of up-to-date manuals and plans to mitigate damage, the establishment of a MoU, SOPs (formal written instructions and guidelines that contain both technical and operational components to facilitate cross jurisdictional and cross- discipline operations), policies and procedures as well as periodic exercises using table-top or full-scale or partial-scale exercises. This coordination and control system should be established by the government before the occurrence of a crisis event.

ICS can be expanded or contracted to match the complexity and size of the disaster incident as well as the availability of resources. This practice is made possible because of the ICS's modular management system (Hanlin & Schulz, 2021). The ICS must be standardised with a defined structural hierarchy and clear responsibilities at each level, as well as common terminology (FEMA, 2017). According to FEMA (2017), effective coordination requires the following components: a common language to articulate needs, common terminology to allow agencies to understand each other during the response operation, policies, processes, joint SOPs for inter-agency communications.

The ICS- Communication Unit

Coordination and control is impossible without communication. Communication is an inseparable component of modern C2 systems and, thus, command failures and communication are intertwined. It is impossible to coordinate and control an emergency response without effective communication. In such situations effective communication acts as the means of linking all the facets of disaster response. Emergency response requires the efficient use of available resources, speedy action and a high degree of precision. Response activities are coordinated through various communication platforms and appropriate information infrastructure among the emergency responders (Andreassen et al., 2020a). The communication unit is established early during the disaster incident and includes all forms of communication used for information sharing such as fax, telephone, electronic mail, messengers and radios. The communication unit is responsible for creating situational reports daily and relaying collective SA information to the various stakeholders. This unit helps to provide both the public as well as response personnel with correct information and, thus, avoid misinformation (Farcas et al., 2021). As observed by (Sundnes, 2014a), a communication system needs to be both resilient and redundant. It should include the use of alternative communication methods that must be built in any plan because often the major aspects of its communication capability may be damaged by the primary or secondary event. According to Hawkins (2007), structurally the communications unit falls under the logistics unit as shown in Figure 2.4 below:



Figure 2.4: Communications unit in an ICS organisation

Source : Hawkins (2007)

Operational best practices of the communication unit

There are a set of widely recognised procedures, established guidelines and methods that have been proven to be effective and efficient in the communication unit that include:

Clear definition of inter-agency operational needs: Multi-agency communications systems organised under ICS demand a comprehensive definition of the operational plans. It should be very clear before an emergency incident which organisations need to talk to each other and under what circumstances. For effective coordination, there should be separate channels for individual functions (operations, logistics and command) to maintain command and control (Hawkins, 2007).

Hierarchical communication: Communication within an ICS should be hierarchical, i.e., conveying information to the person to whom you report within the organisational structure and receiving information from the person who reports to you (Hawkins, 2007).

Communication Procedure: In order to build communication capabilities in preparation for a crisis, it is important to possess a detailed understanding of the individual and organisational hierarchy needs (Hawkins, 2007).

Standard communication: To avoid miscommunication within an ICS there should be a common terminology for position titles, organisational elements, resources and facilities. For inter-agency communication, ICS should establish a common terminology that should be reinforced through appropriate procedures (Hawkins, 2007). Response organisations can also have standard naming conventions for channels and other communication resources across jurisdictions as well as standard programmed positions in the radios for interagency resources. Another language policy includes the use of plain simple language and avoiding jargon and codes.

Operational Unit Reporting: Reporting within the ICS should use a standardised reporting procedure for operational units. This practice can include the unit providing its current position, a statement of needed resources or support required, its progress with current tasks and personnel accountability (Hawkins, 2007).

Communication best practices

The communication practices below help responders from different backgrounds communicate effectively with each other during disaster incidents. All incident responders should use standardised communication types such as strategic, tactical, support and public. All the stakeholders and critical infrastructure owners should be involved in formulating communication management plans and strategies that should be interoperable, thorough and integrated. According to FEMA (2017), the communication plans should address the following aspects: the information needs in incident management and the potential sources of such information, the protocols, procedures and networks to release incident notifications and/or warnings, other critical information and public communication, standards, guidance and tools to integrate information with partner organisations, protocols and mechanisms for notifying partner organisations and other levels of government, protocols for efficient and effective use of information management technologies (networks, computers, information sharing) necessary for integrating all support functions, commands and coordination and mechanisms to ensure inclusivity, i.e., incident messaging is simultaneously accessible to all people regardless of their disabilities, language proficiency, access and/or functional needs. All the parties that participate in an incident within a specific jurisdiction should have agreements in place to ensure common terminology and the required communication elements are in place before the incident strikes. These agreements specify the communication platforms and systems that the parties agree to use for information sharing, data format standards and cyber security agreements (FEMA, 2017). According to Jennex and Raman (2009), the KMS also plays a crucial role and responders need to be trained on the interoperable systems to fully understand the system before an incident strikes.

Characteristics of high-performing ICS

According to Branda et al. (2018), a high-performing incident response network must be adept at four things as shown in Figure 2.5 below:



Figure 2.5: Capacities of high performing emergency response networks Source : Branda et al. (2018)

In relation to the above literature, Schakel and Wolbers (2021) argue that fast response organisations rely on a command and control system comprising hierarchical decision making, tight structuring, formal coordination to establish rapid action, unilateral command and clear lines of authority. However, a crisis often evokes an unexpected turn of events requiring instant decision making, flexible structures and informal coordination. This dilemma therefore, requires frequent adaptation between the different organisational modes: designed, frontline and partitioned.

Designed organisational mode: This is the most recognisable mode of organising. There exists predefined lines of command that involve structuring practices within scalable ICS (Schakel & Wolbers, 2021). These practices include the use of SOPs, relying on protocols and 'plug-and-

play' teaming, nesting scope and detail. Through this mode responders begin collaborating efficiently and swiftly without necessarily knowing their colleagues intimately (Schakel & Wolbers, 2021). Thus, coordination is commonly formalised and planned as SOPs in organisations (Andreassen et al., 2020a). SOPs enhance response effectiveness because the incident commanders can control and coordinate response operations through specified routines.

Frontline organisational mode: This process involves the use of a set of practices aimed at keeping pace with a rapidly developing crisis. The practices include seeking voicing concerns and diverse perspectives, ad-hoc teaming, referring to SOPs, swift trust, plug-and-play teaming and role switching (Schakel & Wolbers, 2021).

Partitioned organisational mode: This mode separates the organisation into distinct pockets of control and command. This practice usually occurs when the responders are faced with a large scale widely distributed crisis (Schakel & Wolbers, 2021).

There is general agreement in the reviewed literature that incident response is not well characterised in terms of a hierarchy (Hardy & Comfort, 2015; Kapucu, Arslan & Collins, 2010) and both practice and theory still dedicate significant attention to developing and understanding more intricate C2 (Abbasi, 2014; Hunt, Smith, Hamerton & Sargisson, 2014). As a result of this practice, there exist two competing schools of thought on emergency response governance (Marcum, Bevc & Butts, 2012). One emphasises the need for centralised control because the ineffective response to disaster is the result of inadequacies in command. This view was earlier propounded by Moynihan (2008) who argued that the crisis nature of disaster requires some form of centralisation for effective response. Another school of thought emphasises the importance of emergent, lateral coordination and argues that failure in disaster response is often as a result of centralised decision making and management (Gardner, 2013). The creation of a balance between these two schools of thought results in "the crisis management paradox" defined as a theoretical and practical challenge that arises from the tension between the need to establish ordered crisis responses and the urgency of providing spontaneous inter-organisational collaboration under stressful conditions (Moynihan, 2008). There should be a clear chain of command that outlines the decisionmaking authority and reporting relationships within the response organisation. This hierarchy ensures an efficient information flow.

Despite its significant contribution to crisis response, the ICS can face implementation challenges in organisations with deeply ingrained hierarchical structures and differing

command cultures. Cultural and organisational barriers, such as resistance to change, can hinder its effective implementation. In addition, not all responders may be familiar or possess sufficient training and/or practical experience in its application. This situation can result in inefficiencies and miscommunication during a crisis. The ICS does not guarantee sufficient resource allocation and management. Lastly, in most crises, the local community are the first line responders and play a significant role in crisis response. The ICS, however, is not designed for use by volunteers, thus, making integration a challenge. According to Briggs (2009), the ICS also faces some implementation challenges. For instance, key positions need to be identified before disasters occur to ensure stakeholders' proper training and readiness. The ICS should also be activated early to prevent incidents from becoming unmanageable.

2.3.3 Characteristics of a high-performing network

In crisis response, high-performing networks possess several key characteristics that enable them to manage and respond effectively to emergencies. These characteristics include:

Prioritisation of communication and collaboration: effective response networks prioritise communication and collaboration amongst the responders by facilitating open channels of communication that enable timeous sharing of information updates and resources resulting in a more coordinated response effort. As noted by Wolbers & Boersma (2019) fast response organisations engage in key response processes known as the the 4Cs of crisis management: communication, coordination, cognition and control. Communication aids situational awareness, the lack of which can prove detrimental, or even fatal, to the success of a response operation (Schakel & Wolbers, 2021). Situational awareness (SA) is achieved through a combination of practices such as labelling and bracketing to develop shared representation, noticing, collective story building, assessing situations and providing continuous updates, nesting of scope and details, contesting planned procedures, active diagnosis of the limitations and referring to standard procedures.

Proficiency in information management: According to Branda et al. (2018), the network must allow for free and rapid flow of information in the required quantities and format at the appropriate time from those who possess it, to enable those who need it to inform strategic action (Steelman, Nowell, Bayoumi & McCaffrey, 2014). There are clear processes and infrastructure for collecting, analysing and disseminating information during a crisis that use data-driven insights to prioritise response efforts and allocate resources where they are needed most (Branda et al., 2018).

Promote interagency cooperation and foster collaboration amongst the responders: According to Branda et al. (2018) the network must provide room for actors to act collectively when an opportunity presents itself among two or more agencies (Steelman & Nowell, 2013). In this case, actors can leverage each other's strengths, thus, producing a more robust force that cultivates a culture of collective learning.

Clear leadership structures and designated roles for members: These systems help to prevent confusion during response and enable prompt decision-making and resource allocation. According to Schakel & Wolbers (2021), rapid decision-making is a characteristic of a high-performing network.

Flexible and adaptable networks: Such systems cater for the dynamic and unpredictable nature of crisis and allow organisations to quickly allocate resources to areas with the greatest need (Branda et al., 2018). The network must be able to rapidly adapt to the ever-changing conditions by adjusting to variations in network size, structure, composition and configuration as actors enter, exit and change positions within the network (Djalante, Holley, Thomalla & Carnegie, 2013; Kapucu et al., 2010).

Flexible: Schakel & Wolbers (2021) assert that a fast response organisation is a flexible, temporal and ad-hoc formation of actors capable of rapidly reacting to a sudden onset of events. Within this scenario, decisions must be made rapidly and errors can be fatal. These organisations can quickly move from their dormant mode to full-scale response as soon as an incident is announced by using their scalable structures and drawing on shared training and experience (Schakel & Wolbers, 2021). They incorporate lessons learned through experiences to enhance the overall response effort. They also engage in regular after-action reviews and evaluations to identify areas for improvement.

Flexible organisations involve and engage with the public and local communities to understand and prioritise the needs of the affected populations and, thus, provide more targeted and efficient assistance (Branda et al., 2018). They efficiently manage resources, ensuring these are distributed according to priorities to avoid waste and develop comprehensive response plans, conduct exercises and regular drills to identify potential risks and vulnerabilities.

2.4 Crisis coordination mechanisms and collaboration practices

This sub-section explores the formal and informal means that are established to resolve crisis coordination issues, including the processes, practices, manners, techniques and systems used in achieving crisis coordination collectively termed the coordination mechanisms. Coordination in crisis management settings is a challenge because there exists both a need for formal command and control, tight structuring and hierarchical decision making to ensure a clear division of responsibilities as well as a requirement for informal, emergent and cooperative relationships to address evolving problems. Thus, coordination mechanisms should both be formal and improvised (Owen, Bearman, Brooks, Chapman, Paton & Hossain, 2013). The following sub-sections explore the various coordination mechanisms.

2.4.1 Coordination definition

There is a lack of consensus on the definition of coordination and different authors define it according to their backgrounds. Hage, Aiken and Marrett, (1971) define coordination as the extent to which there are ample connections among organisational parts that all perform specific tasks so as to achieve the organisational objectives. Similarly, Ven, Delbecq & Koenig, (1976) define coordination as the linking together of different organisational parts to accomplish a collective set of tasks. Malone and Crowston, (1990) define coordination as the extra processing of information performed when numerous connected actors pursue goals that a single actor would not perform. In this study Malone and Crowston's (1990) definition that focuses on managing information, knowledge and effective communication in crisis response was adopted because it focuses on the additional information processing required when multi-agencies pursue goals that an individual actor would not undertake alone. All the authors' definitions concur that coordination involves managing interactions among interdependent components or organisational parts. Actors are linked to achieve a collective goal. However, in contrast, each author's level of detail varies with regard to specific perspectives and descriptions of the coordination process.

2.4.2 Crisis coordination mechanisms

According to Der Heide, Lafond, Eyre, Fertel, Fisher, Gunn, Hampton, Lederman, Posner, Preobrajensky, Rebonato, Riboni, Rodriguez, Shih and Yamamoto, (2001), there is an urgent need to proactively establish coordination and management procedures in advance of any crisis. A number of approaches have been used to improve the effectiveness of crisis coordination. Disaster coordination, especially for massive emergencies, is an extremely complex task that requires significant effort and skill (Comfort & Kapucu, 2006). Coordination mechanisms can be categorised differently in organisations thus, these authors suggest the need for a shift from 'hierarchy' to 'network' structure. According to Abbas, Norris and Parry

(2018), different scenarios call for different coordination mechanisms to coordinate resources for collective action as explained below:

2.4.2.1 Adoption of an ICS

One of the reason why some response organisations are effective in mounting swift and coordinated response to crisis management is the fact that they follow standardised responses to different scenarios and when events become problematic such that the standard procedures fail to suffice, they guickly adapt and operate outside their SOPs and routines (Schakel & Wolbers, 2021). Coordination is achieved by bringing together different response organisations into a unified arrangement (Andreassen al., 2020a). The reviewed literature points out that the adoption of an ICS is a good coordination mechanism for crisis response (Jha, Lin, Short, Argentini, Gamhewage & Savoia, 2018). This coordination mechanism provides a well-defined, structured approach to disaster response, thus, improving coordination and communication amongst the response organisations. The ICS allows various response organisations to collaborate seamlessly facilitating interdisciplinary teamwork that, in turn, fosters cohesive response and optimise resource allocation. A well-structured ICS has clearly laid out roles and responsibilities for individuals and teams (Abdeen, Fernado, Kulatunga, Hettige & Ranasinghe, 2021). This practice reduces confusion and allows for an efficient and well organised response operation (Rouhi, Gorji & Maleki, 2019). According to Bigley and Roberts (2001) ICS reliable, flexible and effective crisis coordination is enhanced when the following basic processes are applied: structuring mechanism (altering the normal organisational structures), constrained improvisation, cognition management methods and organisational reliability.

However, the ICS may not entirely address the resource shortage challenge despite its ability to help optimise resource allocation (Jha et al., 2018). Without technology and proper technological infrastructure, effective coordination is hindered. This problem arises because of the ICS's heavy reliance on technology and infrastructure. Staff may also lack proper understanding or experience of executing this process and, thus, training may be required. There may still be a gap in communication due to factors such as information overload, different levels of command systems, technical issues, misinformation, overloaded communication channels and language barriers. All these aspects can impede the dissemination of critical disaster information to relevant stakeholders for decision making. Other challenges that can affect coordination despite the setting up of an ICS include those associated with coordinating multiple organisations as well as decision-making under pressure. The ICS is supposed to be capable of making prompt decisions under intense

pressure. Resource distribution can also be a challenge to ICS, especially in situations in which resources are scarce. In addition to setting up an ICS as a coordinating mechanism, there is a need for open communication, strong leadership and clear roles to ensure smooth collaboration and reduce inter-agency competition and conflict between the various response organisations. To ensure that the ICS functions optimally, there is a need for a comprehensive approach that addresses the shortfalls identified above. The ICS must be agile and continuously adapt and improve its coordination mechanisms in the C2 system, particularly in the context of the big data era, and found that the coordination mechanism includes decentralised decision making and adaptive response strategies. This system should foster a collaborative culture, provide adequate training, implement lessons learned from past incidents and, importantly, invest in and set up a robust communication system (Zhang et al., 2019).

The insights gained from the reviewed literature on the adoption of ICS lack detailed information as to how it can be tailored for the unique needs of each type of emergency. The ICS implementation evaluation criteria for success may be challenging and, therefore, there is a need to outline the evaluation metrics for ICS success.

2.4.2.2 Strengthening communication channels to allow information sharing

According to Shokr et al. (2022), collaboration is an important mechanism for improving the effectiveness and efficiency of humanitarian efforts. According to Ishiwatari (2021), effective coordination relies heavily on intergovernmental collaboration and well-defined communication channels. This view concurs with that of Abdeen et al. (2021) who identified communication channels and improving collaboration mechanisms as mechanisms for coordination. The focus of setting up the communication channels is to allow for the free flow of information among the responders (Adem, Childerhouse, Egbelakin & Wang, 2018). The findings by Adem et al. (2018) resonate with those of other researchers (Luff, Heath, Patel, Vom Lehn & Highfield, 2018; Rouhi et al., 2019) who carried out systematic literature reviews to explore the coordination mechanisms used by NGOs in disaster response. In the same line of reasoning, Rasool, Samma, Wang, Zhao and Zhang. (2019) also identified real-time data sharing and clear communication protocols.

2.4.2.3 Development and use of technologies

Wagner and Thakur-Weigold (2018) argue that effective coordination mechanisms improve information sharing and optimise resource allocation in crisis response. They identified

coordination mechanisms that involve the development of collaborative technologies as well as decision support systems. Zhang et al. (2019) likewise investigated coordination mechanisms in the C2 system, particularly in the context of the big data era. They ascertained that integrating big data analytics enhances the C2 efficiency and effectiveness during emergency response.

2.4.2.4 Joint planning and mutual understanding

Adem et al. (2018) investigated collaboration among the supply chain and discovered that the coordination mechanism includes joint planning and resource pooling. They also found that collaboration relies on establishing trust, aligning strategies, overcoming cultural barriers and differences in operational practices and decision-making processes. Shokr et al. (2022) also identified joint planning as a coordination mechanism. Ishiwatari (2021) focused on institutional coordination mechanisms between national and local governments in DM in Japan and identified that effective coordination relies heavily on mutual understanding.

2.4.2.5 Fostering a collaborative culture

In emergencies, there exist numerous emergency responders sharing the same vision of service provision to victims, however, post-analysis has revealed that disaster response failure is mainly attributable to poor communication and poor collaboration among the responders (Abbas et al., 2018). This finding calls for a well-structured emergency response network that fosters collaboration among the responders. There is a need for effective collaborative management of people, organisations, ICT infrastructure and systems for effective crisis response effort (Bunker et al., 2014). A response network should have the capacity to increase network resilience by offering multiple pathways through which information flows (Nowell, Bodkin & Bayoumi, 2017). This network should result in meaningful channels of communication between the emergency responders and optimal integrated information flows of work. Prasanna and Haavisto (2018) developed an organisational framework for understanding coordination mechanisms in the humanitarian supply chain that include collaborative norms, shared values and communication openness. These authors found that culture shapes successful collaboration.

2.4.3 Conditions necessary for effective crisis coordination

According to Aldrich (2019), the following conditions are necessary for effective emergency coordination: goal sharing between levels of governance, administrative capacity of local government, levels of logistics planning, civil society capacity, impact of disaster and level of development.

Goal sharing: This practice refers to how well the local authorities and central government harmonise their response vision and may alter the response trajectory (Edgington, 2010). For example, during a disaster, the national government may use disaster response as a chance to remove residents from vulnerable areas that will contradict and disconnect with local plans of increasing affordable housing in the area. Thus, national institutions may press localities to adopt standardised procedures that go against local goals and visions, constraining local culture and innovation. This practice creates compatibility issues between top-down and bottom-up procedures in which, for example, national frameworks can ignore local practices and indigenous knowledge may violate standardised law. Thus, the national government must regularly coordinate events concerning disaster shocks in terms of resilience, extreme weather and DM plans. This practice will ensure effective cooperation and coordination in the event of a major catastrophe (Aldrich, 2019).

The level of governance: This process concerns the structure and processes for decisionmaking, accountability, control behaviour at the top of an organisation. This practice requires a legal framework, the rules, procedures and roles of responsibility that influence the organisation. One problem in the area of crisis response is how to structure a response in a manner that promotes lateral information flow to enable emergent coordination to occur (Gardner, 2013), while retaining flexibility to easily scale-up and add new actors as well as to mutually adjust operations swiftly to changing conditions on the ground and lastly reconciles needs for centralised coordination among the array of responders involved (Gardner, 2013).

The type of society: More transparent and democratic societies/nations might find collaboration easier because, instead of overruling local disaster managers, they would seek to consult (Aldrich, 2019).

Local government funding: Local governments should be fully funded in order to be able to coordinate their own well-oiled crises response. Local government's dependence on national government for financial and administrative resources can stifle crisis response (Aldrich, 2019).

Society/nation's level of development: The level of development of the affected community may affect the effectiveness of crisis coordination (Manandhar & McEntire, 2014). Effective crisis coordination is more likely in developed societies with higher levels of professionalism while developing societies with authoritarian or less democratic governance may have less effective crisis response coordination (Aldrich, 2019).

A sound logistics structure: Effective crisis coordination requires that there is a sound logistical infrastructure allowing the society to acquire personnel, material and information such as where its members need to go during a crisis (Aldrich, 2019).

A local disaster culture: Residents need to be aware of cultures of disaster while national leaders and decision-makers must be part of strong institutions. A local disaster culture refers to families and businesses being mindful of risks and threats and creating and drilling crisis responses. Through the creation of strong institutions, decision makers in the national government will be able to maintain strong regulations and governance practices that minimise harm. The central government should also establish a physical infrastructure that mitigates the threats. Government agencies should also have preplaced materials, including housing, food, rescue and water outside of potential disaster zones and along resilient transportation routes (Aldrich, 2019).

2.4.4 Empirical studies: coordination mechanisms

This section focuses on empirical studies on coordination and collaboration in crisis response. The aim of carrying out an empirical review in this section is to furnish valuable data and evidence on crisis coordination and collaboration, validate established theories and pinpoint gaps in current crisis coordination and collaboration knowledge. Furthermore, it aims to present real-world scenarios, illuminate trends and enable the evaluation of research methodology. The section enhances the understanding of local crisis response coordination by analysing crisis coordination programmes implemented in other countries with a focus on understanding their structures, information and knowledge management, ICS, the challenges they face and the coordination mechanisms they use.

2.4.4.1 Coordination models for crisis responses

A research study by Rouhi et al. (2019) presents a systematic review of coordination models that have been employed by NGOs during disasters. This review was conducted from October to November 2017. A search in electronic sources, including Web of Science, PubMed, Scopus and ProQuest Research Library was undertaken to identify relevant articles. Journal articles published in English and conference papers were included in the study, while irrelevant and non-English journal articles and conference papers not available in full text were excluded. Thematic analysis was used to analyse the selected articles and papers. Only 7 studies from 871 documents captured were identified as eligible for extraction. From the review of these studies, eight models were identified as having been implemented by organisations at international, national and local levels for dealing with natural hazards. These models provide

a framework for NGOs to act collaboratively with other agencies to deliver a unified and effective humanitarian service. These models include:

- 1. Sphere project: This project was founded by the International Red Cross and Red Crescent (ICRC) Movement together with a group of NGOs after the Rwandan genocide. The project provided a tool for interagency coordination at incident sites during a crisis. The Sphere project guided all crisis responders in all sectors that included: agreement and cooperation principles, a protocol for assuming duties and a summary of the health sector and gaps in the health sector. The Sphere project is considered best practice in crisis response.
- 2. The code of conduct: This code is used as a guideline for creating coordination amongst the humanitarian actors, it provides a standard of behaviours guiding the humanitarian actors and seeks to maintain the effectiveness and impact to which humanitarian actors aspire. The code was published after the Rwandan genocide by the ICRC.
- 3. Cluster approach: The major objectives of the cluster approach at country level are: creating a framework for effective coordination and collaboration among international and national organisations in each cluster as well as the establishment of a clear system of international leadership and needs in each cluster. The major aim of the approach is to enhance the effectiveness, efficiency, flexibility and availability of sufficient funding and, ultimately, improve coordination.
- 4. Decentralised approach: Humanitarian coordination can be facilitated through either centralised or decentralised systems. The decentralised approach in which each actor independently makes decision is the most favoured one compared to the centralised approach in which there is a main player with the authority for directing relief. Information sharing can then utilise any of the decentralisation approaches such as Inter-Agency Standing Committee (IASC) and Inter-Agency Working Group (IAWG).
- 5. National Disaster Management Authority: This approach supports multi-stakeholder coordination and collaboration, promoting response through the development of policy, plans and guidelines at the national level.
- 6. Conceptual Integrated NGO Collaboration Framework for Community Post Disaster Reconstruction (CPDR): This framework was developed in China after an earthquake. An association of NGOs was formed to reduce the burden on the government and the people. An Integrated NGO collaboration framework (CPDR) which included the following interrelated components was developed: operational processes, organisational structures and reconstruction goals.
- 7. Model of temporal coordination of disaster response activities Nafeer: An example of a crisis in Sudan in which voluntary groups responded to the flood revealed that the

groups created a flat/horizontal structure that was divided into 14 equal independent committees, including a coordination committee responsible for synchronising other committees. This structure facilitated the involvement of staff in decision making and using this mechanism and resulted in the voluntary group's successful response effort.

8. A web based, open-source application – Collabit Application: This application was introduced by the New York City Voluntary Organisations. Its main role was to facilitate the receiving and sharing of asynchronous data and the creation of a shared operational vision amongst the different response organisations that fostered coordination.

The results of the reviewed studies emphasise the existing gaps, both practical mechanisms and theoretical knowledge, and stresses the need for further research. For example, the literature review investigated the role of technology in facilitating coordination amongst the responders. Only English language articles and papers were included in the systematic review yet documents in other languages could provide additional coordination model mechanisms, therefore, this deficiency limits the generalisation of the research findings. Another limitation is that this paper is silent on the effectiveness of the eight identified coordination models. Another research study could focus on the challenges faced in implementing these eight coordination models. In light of these limitations, future research may focus on addressing these identified gaps so as to provide a more comprehensive understanding of crisis coordination. Shedding light on coordination approaches helps in enhancing disaster response and management effort. This paper aims to assist officials, policy makers and authorities to provide well-coordinated services during disasters and, thus, address the current crisis coordination and collaboration gap.

2.4.4.2 Coordination mechanism Nepal earthquake

The paper by Bisri and Beniya (2016) analyses the coordination mechanism and the mandatory emergency response operational activities outlined in the National Disaster Response Framework (NDRF) following the 2015 Nepal/Gorkha earthquake. Findings from this study reveal that the coordination mechanisms and mandatory emergency response operational activities outlined in the NDRF were partially implemented during the six months after the earthquake. Out of 62 mandatory emergency response operational activities, 30 were performed following the timeline set by the NDRF, 17 were implemented outside of the NDRF timeline or with some negative notes on the implementation and 15 were not implemented at all. Practically, this paper provides important lessons for other developing countries on the importance of a clear and concise framework for emergency response operational activities.

It emphasises the importance of setting up a disaster response framework. The key finding is that coordination mechanisms can provide an important first point of reference and guidance at a time of disaster. However, future research can focus on gaps identified in Bisri and Beniya's (2016) study. Matters of interest arising from this research are the factors that can hinder the implementation of the NDRF, as well as the reasons why some of the mandatory emergency response operational activities were not implemented.

2.4.5 Case studies and success stories: collaboration practice.

The following section presents case studies related to coordination and collaboration, along with several success stories found in the literature. Given the limited existing research on this topic, the cases included in this study are those that the researcher identified as relevant to the investigation at hand.

2.4.5.1 Information flow within EOC

The study undertaken by Sederholm et al. (2021) explored the inter-organisational communication and SA in an Emergency Operation Centre (EOC) during a major explosive fire during a concert and sought to find out what kind of information was needed and delivered as well as the information source and target. The focus of the study was to describe the information flow for enabling situation awareness in an EOC. A qualitative case study design and observational approach was used for conducting the survey. Empirical data was collected at the EOC using such sources as incident logbooks and time-stamped documentation of all response communication and actions. Deductive content analysis was used to analyse this data. Choo, Furness, Paquette, Van Den Berg, Detlor, Bergeron and Heaton's (2006). (Choo et al., 2006)IM model was used for creating the themes for analysis. These themes comprised information needed and delivered, information sources and targets, and methods used to receive and deliver information.

Findings from Sederholm et al.'s (2021) paper revealed that sharing information between different public safety organisations plays a vital role during major incidents. Common SA among the actors is a key element for achieving successful results when managing and leading operations. The EOC played a fundamental role in creating collaborative awareness, long-term commitment, and familiarisation with organisations and, thus, helped to tackle the known challenges in multi-authority coordination. The research findings showed that familiarity and long-term commitment between organisations are essential elements in improving the effectiveness of crisis response management and should be implemented even during the planning and preparedness phase. However, the study was conducted in a specific context

and location, a fact that may limit the generalisability of the findings to other contexts and locations. The study did not provide a detailed analysis of the information overload issue which also may limit the practical implications of the findings.

2.4.5.2 Collaboration practices

A systematic review of literature was conducted by Duong and Chong (2020) to explore the effective of supply chains during times of disruption. A comprehensive review of a total of 157 papers written from 2000 to 2020 was undertaken and findings based on a thematic analysis presented. One of the themes that emerged from the study was the use of collaboration mechanisms for responding to disruptions. According to Duong and Chong (2020) the following categories of collaboration mechanisms were used in coping with disruption in supply chains: joint practices, contractual and economics practices, technological and information sharing practices, relationship management, assessment practices, governance practices and supply chain design.

Joint practices: This collaboration mechanism entails establishing consensual plans between the partners to work towards a shared goal (Duong & Chong, 2020). For this mechanism to work, there is a need for an integrated decision model and, hence, synchronised decisions for the humanitarian operators to accomplish their goals (Shahparvari & Bodaghi, 2018).

Contractual and economics practices: This collaboration practice involves legal agreements that are enforceable by law that specify the terms under which the operators will function. Expectations from operators are identified and partners should fulfil these expectations (Duong & Chong, 2020).

Technological and information sharing practices: This mechanism's purpose is to put in place systems that provide relevant and accurate information for collaboration. A system such as Enterprise Resource Planning (ERP) is useful in a humanitarian supply chain (Duong & Chong, 2020)

Relationship management: According to Duong and Chong (2020), this mechanism fosters collaboration through embarking on activities that enhance stakeholder relationships and commitment, such as motivation, communication (Wagner & Thakur-Weigold, 2018) and training. However, to ensure a sound stakeholder relationship, trust must exist (Li, Zhang, Cao, Liu & Qu, 2019).

Governance practices: This mechanism shapes collaboration and addresses the laws, rules, regulations and policies that manage the activities, organisations and systems (Duong & Chong, 2020).

Supply chain design: Collaboration is facilitated by proposing decision making tools for supply chain partners (Duong & Chong, 2020).

Based on their systematic review Duong and Chong (2020) revealed that humanitarian supply chains have not adopted the contractual and economic mechanism unlike the commercial supply chains that adopted all seven mechanisms. The humanitarian supply chains have focused mainly on relationship management and the joint practices. However, the study presented by Duong and Chong (2020) does not provide a quantitative analysis of the reviewed literature, a fact that may limit the generalisability of its findings.

2.4.5.3 Collaboration practices – inter-agency information sharing

In a study commissioned by the World Health Organisation (WHO), Jha et al. (2018) conducted a systematic review of literature aimed at assisting in the creation of Emergency Risk Communication (ERC) guidelines for member states. The paper sought to answer three main research questions: (1) What are the best practices for integrating ERC into public health preparedness at national and international levels?; (2) How can information sharing between different agencies, both within and across jurisdictions, be facilitated? and (3) What methods can be employed to coordinate risk communication efforts among various responding agencies?. The review covered articles from January 2003 to February 2016 and encompassed various hazardous situations, including pandemics and outbreaks of infectious diseases. The study identified several mechanisms to enhance inter-agency, intra-agency and cross-jurisdictional information sharing for ERC, including:

- Integrating ERC functions into national leadership structures.
- Ensuring the proximity of ERC practitioners to national response leadership.
- Developing supportive laws, regulations, policies and frameworks.
- Employing training and exercises to test system effectiveness.
- Establishing task forces/committees and networks to strengthen ERC.
- Utilising information systems and platforms to bolster ERC.
- Encouraging engagement of local stakeholders in ERC.

Furthermore, the above study highlighted methods for coordinating risk communication activities among responding agencies, such as:

- Establishing committees/task forces comprised of key stakeholders to foster trust and information exchange.
- Emphasising network teams over hierarchical ones, allowing rapid information exchange, quick decision-making and mutual trust.
- Facilitating information sharing between decision-making units.
- Designating a Public Information Officer.
- Utilising information systems and technology infrastructure for information acquisition and exchange.
- Involving local stakeholders in ERC strategies, leveraging existing social networks and community-based communication systems.

The study conducted by Jha et al. (2018) noted a connection between ERC functionality and a nation's political and cultural context, highlighting the importance of understanding these factors to ensure the creation and implementation of effective ERC strategies.

2.5 Barriers to effective coordination and collaboration

This section describes the information exchange, coordination and collaboration challenges in crisis response. Crisis coordination may be difficult owing to a number of factors (Andreassen et al., 2020a). Understanding the barriers and challenges to effective coordination and collaboration is crucial because it contributes to better coordination dynamics (Andreassen et al., 2019). It is prudent to investigate the barriers to effective communication amongst the emergency responders to discover possible points for improvement (Abbas et al., 2018). During disaster response coordination and collaboration amongst the emergency responders is crucial since no one agency has sufficient resources to address the challenge alone. Responders, thus, need to exchange information on the extent of damage, number of victims affected, the dimension of the required response and the anticipated complications, sector specific tools and expertise as well as relevant research findings (Abbas et al., 2018). According to Thompson (2006) barriers to disaster response fall in two categories: internal and external to the response organisations. External barriers are those that are inherent in the agile decision-making environment that defines most disaster response settings while internal challenges relate to the decision making processes and procedures within the organisation and the strategies used for collecting, processing and analysing data (Thompson, 2006). Abdeen et al. (2021) contrastingly categorised the challenges in multi-agency collaboration in crisis situations according to the following seven categories: social, environmental, political, intra-organisational, inter-organisational, infrastructure and communication. Information sharing among the emergency responders may be affected by a number of factors listed below:

Communication: Abdeen et al. (2021) investigated the challenges in multi-agency collaboration in crises. The dominant challenge they faced during their study was communication owing to a lack of well-defined guidelines for information sharing amongst the emergency responders to establish a common view of the crisis context. This situation was exacerbated by the lack of technology platforms and communication infrastructure for information sharing and the inter-operational issues that existed among the agencies.

According to Owen et al. (2013), an inability to connect multiple communication architectures and plans hamper coordination. The heterogeneity of the systems involved impedes communication and, thus, inter-organisational collaboration. Poor information accessibility can be due to a lack of appropriate interfaces for viewing information, policy issues restricting access to important information for the response operations and terminology differences in information structuring in discrete organisations. Some technical and organisational structures of each of the participating organisations failed to provide suitable interfaces to afford this free flow of data during emergency incidents as a result of the heterogeneity of the systems involved. This situation negatively affects inter-agency information and expertise sharing. Ley, Ludwig, Pipek, Randall, Reuter and Wiedenhoefer (2014), however, asserted that, in a crisis, some types of information have to be shared as quickly as possible to all operators in an unambiguous and accurate format.

According to Ley et al. (2014) the information retrieval and exchange processes at the C2 can act as barriers to crisis coordination and collaboration among responders. Information retrieval for situation awareness and decision making usually is triggered by a warning message or incoming emergency call. To be adequately prepared, the emergency response decision makers need to be able to collect the correct information at the appropriate time in the correct format from various sources. However, the control centre often faces challenges retrieving information from other organisations that use different emergency management and communication systems designed to address their own specific needs and, thus, not directly accessible by other organisations. There is a lack of interface between the control centre and other response organisation's software. Inter-organisational sharing is also a challenge. Large scale incidents call for ad hoc information retrieval and spontaneous communication, however, in most cases the organisations' predefined structures and processes are insufficient for this process. This deficiency requires improvisation on the part of the decision-makers. The design solution to facilitate effective inter-organisational information exchange and communication is to create interfaces between the different systems. Ley et al. (2014) proposed that various heterogeneous individual systems should be connected through the development of a serviceoriented architecture web-based system. This system provides flexibility at the technical level, offers platform independent access that acts as a lightweight intermediary between the different interfaces. However, challenges regarding the implementation of such a system exist at an organisational information level due to the following reasons:

- i. The knowledge of what type of information housed by a specific organisation is relevant to other response organisations and which of these organisations rely heavily on their many years of experience with emergency response networks. Systems, therefore, should possess instruments for distributing appropriate and articulate information regarding the overall emergency response process to all the involved organisations. Since it is difficult to predict all the information needed before a disaster occurs, actors must ensure that the necessary supplementary meta-information is automatically added. This practice will allow even the most inexperienced users to search through the available information and access it easily and promptly.
- ii. In order to deal with large amounts of external information and distribute it to individual response organisations, centralised access to the decentralised information sources is essential. There should be a central access point with standardised interfaces together with the offer of meta-attributes that provide organisations with information as to where and how to access information from other organisations. This access point can be realised by a shared, web-based information repository. To deal with the use of outdated information the maintenance of individual information and its meta-attributes in the repository should be decentralised. Each organisation should be responsible for the accuracy and timeliness of the information it provides.

Another challenge associated with the retrieval of situation awareness information is the fact that such information is differentially acquired and there are varying levels of expertise among the users of some of the technologies. In order to deal with the terminology challenge, Ley et al. (2014) proposed involving visualisation techniques that operate with images and icons instead of exact terms of descriptions whenever possible. Lack of information is also a barrier to crisis coordination and collaboration. These authors observed that, owing to time constraints, the various response organisations often focus on themselves and their work tasks and overlook proactively providing information to each other. This practice also can be caused by a limited conception of what information other response organisations might find useful. For example, a lack of information was also noted during the Hurricane Katrina disaster when a lack of information-situation awareness hampered C2 and, hence, the response effort (Andreassen et al., 2020a).

The disparity of information also acts as a barrier to effective information sharing amongst the responders because some of them disseminate incomplete information. The quality of information is difficult to assess – crisis information comes from a variety of sources including the Internet. The truthfulness, relevance and correctness of such information is questionable. Citizen-generated content often lacks the required level of consciousness because citizens just transmit information without the knowledge of the relevant information required by the authorities and other response organisations. This practice of sharing inaccurate, duplicate, misleading and impressionistic information results in information overload that requires considerable filtering of the data sources. Many response organisations have on-site actors who collect and communicate information about the situation on the ground.

Mandate, power and resources: According to Sundnes (2014a) effective coordination and control only takes place when the following three elements are adequately represented: mandate, power and resources (Figure 2.6). Sundnes (2014a), however, observed that often in crises, one of these three elements is inadequate. As a result, response operations become haphazard, disorganised and without clearly stated goals and objectives. The response operation is characterised by an unacceptably high percentage of an inappropriate and uncontrolled influx of assistance.



Figure 2.6: Requirements for effective coordination Source: Sundnes (2014b)

A mandate entails the political authorisation to provide DM and, thus, CCC requires such a directive to provide the service. Power refers to the official capacity to exercise control. It

means the authority, right and responsibility to implement any action needed. Effective coordination requires the ability to control events. Thus, the ability of the CCC to dictate the actions necessary for an appropriate response requires its possessing both the mandate and the power to do so. Resources include the availability of knowledgeable and experienced staff, funds, supplies and information systems that constitute the 'means to achieve the end'.

Lack of system sustainability and resource efficiency: Effective coordination and collaboration requires an information system capable of constantly updating and sharing disaster information. There is also need for skilled manpower to effectively view and interpret the evolving situation and making decisions accordingly (Bunker et al., 2014). In an emergency situation, the operating scenario must be gathered, processed and delivered via various technology channels such as mobile phones, telephone, SMS, email, web pages and facsimiles to ensure effective management of the disaster. The system must be flexible, resilient and fault tolerant. Despite emergency responders having a common disaster response vision, similar operational characteristics, many have failed to collaborate effectively, share personnel, tools or adopt technologies such as cloud computing, Internet of Things and big data analytics that are currently revolutionising disaster response (Haikerwal, 2011).

Poor planning preventing the formation of a shared mental model: In a disaster situation, decision-making needs to be dynamic and distributed across different agencies that share common goals. While it is not practical to unify everyone's perceptions and objectives, it is important to have a shared mental model (SMM) to enhance collaboration amongst the various agencies. A SMM provides information concerning individual responsibilities (Farcas et al., 2021). A case study is the railway accident that occurred in the United Kingdom in which coordination was difficult due to a poorly distributed SMM. Inadequately distributed shared mental models contribute to difficulty in coordination during an inter-agency response. (Farcas et al., 2021).

Difference in organisations: This difference can be in terms of organisational interests (Duong & Chong, 2020). As noted by Adem et al. (2018), different organisations that collaborate during an emergency usually have their own motivations and mission statements. An example would be that the government would collaborate when the crisis becomes overwhelming because it cannot deliver the aid individually. On the other hand, the NGOs would collaborate to enhance the efficiency and effectiveness of their relief operations as well as enhancing their organisational capacities. The private sector would collaborate as part of their social responsibility and hence strengthen their brand and expand their work. Adem et al. (2018) call this factor a lack of mutuality.

Adem et al. (2018) noted the different objectives and priorities, barriers of culture and language, and the asymmetry of power between partners. Even though emergency responders all share the same vision of providing response services to disaster victims, it is common to expect the various sectors to face some challenges that stem from their different cultural origins. This situation arises because the way the individual agencies perceive information is completely different and depends on the type of tasks this information will be used for and the fact that these agencies also have different decision factors (Abbas et al., 2018). Therefore, to achieve mutual understanding and collective decision making, it is important to understand that information needs to be communicated amongst the emergency responders. The responding agencies, therefore, need to first understand their basic concepts, processes and structures and have standardised definitions and sector specific terminologies so as to synthesis the complete picture of the collaborative disaster response. To address this challenge, there should be combined educational courses offered to emergency responders and agencies should have an understanding of how all other party operate and their cultures so as to communicate smoothly (Abbas et al., 2018). Different response organisations have varying professional cultures that hinder them from effectively sharing and interpreting disaster knowledge (Wolbers & Boersma, 2019). The shared values and beliefs that an organisation holds tend to have an impact on the collaboration outcome, culture can either facilitate or hamper collaborative practices (Prasanna & Haavisto, 2018). However, this challenge can be addressed by training members to understand the professional languages used by different stakeholders. According to Andreassen et al. (2019), different agencies and institutions exhibit variations in terms of roles, command structures, organisational structures, operational patterns and responsibilities. Response agencies lack knowledge and understanding of each other's work processes (Sederholm et al., 2021).

Failure to understand the crisis operational context and lack of adaptability: Failure to understand the crisis contextual environment can act as a barrier both to effective crisis coordination and crisis response. The coordination of emergency response is characterised by limited response actors, or actors with limited competencies, and unsuitable response technology that may be hampered by the adoption of a hierarchical division of authority and tasks. This contextual environment requires a more flexible and informal structure that facilitates on-the-spot coordination and decision-making. Thus, coordination should be more dependent on ongoing tasks that emerge in responding to the crisis rather than on the design. This flexibility is achieved through considering the following processes: system resetting, structure elaboration authority migration and role switching (Andreassen et al., 2020b). This redistribution goes beyond the formal framework as specified in the ICS by distributing roles

and tasks between organisations and individuals as an adaptation and operational context. Thus, adapted managerial roles are necessary for providing a platform for emergent coordination mechanisms (Andreassen et al., 2020b).

Lack of information governance mechanism: To make effective decisions in a disaster information shared environment, regardless of source, there is a need to guarantee the accuracy, authenticity, legality and reliability of the received information (Bunker et al., 2014)

Challenges of authority: According to Abbas, Madanian and Parry (2016), a potential barrier to collaboration amongst the emergency responders is the differences in authority structures that reflect on operational modalities, institutional cultures, capabilities and how each agency responds to disaster. Traditionally, emergency managers have been trained according to a C2 model that currently is proving to be out of touch with emergency response realities that require rapid, adaptive decision-making aided by collaborative situation awareness between the responding groups. Willis (2014) contends that responders should have a holistic picture of the situation at hand through the establishment of cross sectorial horizontal information exchange between responders that enables the sharing of knowledge and expertise as well as reducing response costs. In such fluid, cross-agency and transitory arrangements, management is different from the usual vertical and horizontal management practices common to stable organisations and, thus, requires a different set of skills and knowledge. For example, the C2 modus operandi is not the most appropriate in disaster situations but rather facilitative leadership that focuses on shaping the operating context, selecting appropriate resources and agencies, developing ways of coping with the operational and strategic complexity is more appropriate. Abbas et al. (2018) argue that there should be clear roles and responsibilities in cross sector collaboration that are well defined yet sufficiently flexible to achieve the aims of the crisis response as a whole.

Technical challenges: Most of the disaster communication challenges discussed above are organisational and human issues. However, much of this communication is facilitated by technology that has become key in disaster response. The lack of technical compatibility, i.e., the ability of two or more ICT applications to accept data from each other and perform a given task satisfactorily without the need of extra operator intervention, can be a barrier to agent collaboration. In disaster response situations, each responder usually has its own information storing processes and access controls that are pertinent to its mandate. Barriers to technical interoperability include mismatched data structures, software or hardware incompatibility, incongruous data and information channels, different terminologies, incompatible database designs and conflicting data definitions (Loop, Lubitz, Von, Beakley & Patricelli, 2008). A lack

of technical connectivity and flexibility is a barrier to effective collaboration as different response organisations manipulate information from different locations, different forms and through different channels such as offline, online or mobile (Bunker et al., 2014).

Situational awareness challenges: SA refers to people recognising and knowing what is going on around them. Endsley (1988) defines SA as "The perception of the elements in the environment within a volume of time and space, the comprehension and the projection of their status in the near future". This perception is required for moment-to-moment decision-making and, hence, improved response performance in complex situations. This disaster information is required timeously to mobilise resources, inform people and calm public anxiety. Commonly, the exchange of information in such situations is usually vertical in which the top-level central agency exchanges information with responders (Abbas et al., 2016). Although this approach works, there is also a need to establish real-time horizontal information exchange networks among agencies because this method is efficient, timely and leads to improved decisions and actions. Thus, there is a need for a coordinated approach to the information exchange essential for SA.

Inadequate knowledge and experience: This deficiency is a behavioural barrier because partners without adequate knowledge and experience act as hindrances to effective collaboration (Adem et al., 2018). This concurs with the views of Ley et al. (2014) who noted that collaboration among spatially distributed response actors from different organisation is difficult. Usually it is achieved through one-to-one phone calls that mainly depend on knowing who to contact from which organisation. This challenge is even true for members within the same organisation. Those members on-site and those at the control centre usually communicate through speech or radio. Responders often find it difficult to know the right person to contact and even how to contact them and, thus, this problem affects inter-organisational expertise sharing. There should be a simplified way that addresses the current needs for inter-organisational collaboration.

Legislative challenges: This difficulty applies when there are legal implications to sharing information and relates mostly to health-related disasters. In the healthcare context, there is a need to protect patients' confidentiality and privacy. Thus, in collaborative disaster response, there is a need to emphasise legal interoperability (Abbas et al., 2018). Financial and human resources are necessary for any collaboration activity (Duong & Chong, 2020). Poor communication has been identified (Adem et al., 2018) and includes a lack of standardised communication (Sederholm et al., 2021). According to Adem et al. (2018), collaboration has been hampered by misunderstanding of terminology.

Lack of trust, commitment and mutual respect: Commitment, information sharing, mutual respect and trust have been identified as key success factors for effective collaboration (Duong & Chong, 2020). According to Dubey, Gunasekaran, Childe, Roubaud, Fosso Wamba, Giannakis and Foropon (2019), (Dubey et al., 2019) trust is a fundamental ingredient for collaboration. Trust has interrelated and dual aspects, trust in the other party's competence and trust in integrity. The partners should believe that the other stakeholders are able and willing to accomplish their duties as only through high levels of trust will better collaboration exist (Adem et al. 2018; Prasanna & Haavisto, 2018). With trust in integrity, there is confidence that the other party will willingly share all relevant information and not withhold any data, commit to shared laws and contracts, work jointly with due diligence and maintain confidence. On the other hand, trust in competencies refers to confidence that the other party has the resources, abilities, skills and willingness to effectively contribute to the collaborative relationship (Salem & Jarrar, 2009). Trust is an important aspect of collaborative work because agencies that trust each other engage in joint action, problem-solving and information sharing. Trust reduces the need for formal contracting and transaction costs and eases the need for control (Dyer & Chu, 2003). Another important component of collaboration is information sharing which requires that the person giving the information trusts the person receiving the information. Interpersonal trust has a significant influence on information exchange because once the sender perceives the receiver as someone who is not using the information professionally and judiciously, the sender tends to withhold the information. The means of information sharing that can influence trust can involve the use of blogs, email exchanges and web conferencing. Co-locating main actors is another factor fostering cross-agency trust because locating these actors in the same physical space facilitates effective communication, increases efficiency due to better coordination of tasks, improves information interpretation and, ultimately, reduces response time. Abbas et al. (2018) advocate incentivizing the sharing of knowledge and information through appraisal systems as well as formulating legislation enforcing information openness both between and within collaborative stakeholders. The establishing of connections with the right partners is important for effective collaboration, thus, reciprocal stakeholder relationships are key for collaboration in crisis response.

2.6 Chapter insights guiding framework development

The literature review in this chapter provided a foundational understanding that directly informed the development of the KM framework aimed at enhancing coordination and collaboration among emergency responders in Zimbabwe. Each subheading contributed crucial insights that connected to the framework as explained in Table 2.1 below:

Chapter	Contribution to KM Framework Development
subheading	
Disaster	This section established the foundational context for the study by
management	outlining the principles and practices of DM. It highlighted the necessity
overview	for coordination and collaboration among various stakeholders, which
	guided the framework to address specific needs and challenges faced in
	Zimbabwe, ensuring its relevance.
Organisational	This section explored various theories related to organisational structure,
theory in	culture, and dynamics, thus providing insights into how emergency
disaster	responders operate. This understanding allowed the framework to
management	incorporate elements that promote effective collaboration and alignment
	of goals among different agencies.
Crisis	This section reviewed literature on the existing coordination mechanisms
coordination	highlighting effective strategies and areas needing improvement. It
mechanisms	informed the KM framework's recommendations for strategies that build
and	on existing strengths while addressing gaps and inefficiencies, ultimately
collaboration	enhancing coordination among emergency responders.
practices	
Barriers to	This section reviewed and identified potential obstacles that hinder
effective	effective communication among emergency responders. By recognising
coordination	these barriers, the framework proposed targeted KM strategies designed
and	to mitigate them, ensuring that it not only promotes collaboration but also
collaboration	addresses specific challenges faced in Zimbabwe.

Table 2.1: Contribution of sections to KM framework development

2.7 Chapter summary

The reviewed literature has shown that effective crisis coordination requires a balance between the two approaches to coordination, i.e., adapting the C2 control approach for formal structures and SOPs while at the same time focusing on adaptability, agility and improvisation. Decentralisation tends to offer significant advantages during extreme events. Previous studies have shown that decentralised approaches to disasters provides more effective and harmonious disaster response compared to the centralised approach. This chapter has shown that responding successfully to extreme events requires different organisations to collaborate effectively. This practice requires active communication channels for information sharing, requesting resources, exchanging expertise and reporting and briefing. Thus, a coordination response operation network is formed through which these different actors exchange resources, expertise and information. It also emerged from the discussions that efficient coordination involves large volumes of information sharing and seeking as well as rapid decision-making.

CHAPTER THREE

KNOWLEDGE MANAGEMENT AND ICTS FOR EMERGENCY AND CRISIS RESPONSE

3.1 Introduction

The purpose of this chapter is to comprehensively review literature that addresses this study's research objective 3, namely: "To recommend key Knowledge Management (KM) strategies that DCP can implement to ensure effective coordination and collaboration among emergency responders in Zimbabwe." The main research question is "What are the KM strategies that can be implemented in crisis response to ensure effective coordination and collaboration?" This question is supported by two sub-questions: (1) "What are the barriers to effective coordination and collaboration in crisis response?" and (2) "What ICTs can be used for managing crisis information and for collaboration?" There are many studies and articles discussing KM and ICTs. However, since the focus of this research was on the use of KM and ICTs for crisis coordination and collaboration, only certain areas were considered appropriate for review. Figure 3.1 below provides the chapter roadmap to guide the reader:



Figure 3. 1: Chapter outline

Source: Author

3.2 Definitions

3.2.1 Knowledge

Knowledge is defined as the purposeful coordination of action. Antunes and Pinheiro (2020) describes knowledge as the intellectual resources of an organisation. They emphasise that an organisation's ability to use and leverage knowledge is heavily dependent on its human resources, who create, share and use that knowledge. Knowledge, therefore, can be encouraged by a set of collaborative HRM practices (Antunes & Pinheiro, 2020).

3.2.2 Knowledge management

Knowledge Management (KM) is concerned with managing people's relationships as well as how the people who implement the KM processes are effected by organisational structures, leaders, process teams and culture (Fombad & Fombad, 2018). Fombad and Fombad (2018) focus on the impact of organisational factors on KM processes, highlighting structures, leaders and teams' roles in KM. On the other hand, Iskandar, Jambak, Kosala and Prabowo (2017), defines KM as the effort expended to systematically find, organise and make available a company's intellectual capital and to foster a culture of continuous learning and knowledge sharing so that organisational activities build on what is already known. Their definition places more emphasis on organising and making available intellectual capital and fostering a culture of continuous learning and knowledge sharing. Similarly, Oktari et al. (2020) describe KM as facilitating the collective and systematic creation, distribution and utilisation of knowledge by individuals, teams and the entire organisation to achieve the organisation's goals. Oktari et al.'s (2020) definition takes a holistic approach by stressing the collective and systematic creation, distribution and utilisation of knowledge throughout the entire organisation, including individuals and teams and, thus, this definition was adopted in this study. KM's focus goes beyond mere data accumulation and retention, it pertains to guaranteeing that appropriate information is accessible to the correct individuals when needed, thus, highlighting the importance of knowledge application rather than just knowledge creation. Mouritsen (1999) provides another interesting definition by describing KM as a process that seeks to prevent the retention of knowledge within specific employees or divisions, and instead, encourages its dissemination and application throughout the entire organisation. The focus of this definition is to ensure a connection between those who possess certain knowledge and those who need that knowledge.

It is interesting to note that all definitions centre on the idea of managing knowledge within an organisation to achieve specific objectives. Emphasis is also placed on the importance of culture and people in KM implementation and the importance of organisational learning (OL) and leveraging existing knowledge to improve organisational activities. However, the definitions differ regarding the specific elements on which they focus within the KM process.

3.2.3 Knowledge management systems

Knowledge management systems (KMS) are designed and used by organisations specifically for the creation, sharing and storage of knowledge. They facilitate open and collaborative ecosystems as well as the exploitation of both external and internal flows of knowledge (Santoro, Vrontis, Thrassou & Dezi, 2018).

3.3 The Knowledge-Based View

3.3.1 The foundations of the knowledge-based view

The knowledge-based view (KBV) of the firm is an extension of the resource based view (RBV). The interpretation of knowledge as a resource establishes the theoretical connection between the RBV and the KBV. The RBV primarily concerns the internal aspects of the organisation, its capabilities and resources and how these can contribute to the overall effectiveness of the organisation (Pereira & Bamel, 2021). The RBV cautions against focusing on external factors, such as market conditions or competition, but rather on leveraging its internal resources effectively. The RBV theory maintains that by utilising its unique resources and capabilities, an organisation can create a competitive advantage that can set it apart from its competitors (Curado & Bontis, 2006). A fundamental concept of this theory is that there are differences in capabilities and resource heterogeneity, thus, resources that are rare and valuable compared to those of competitors differentiate the organisations.

Knowledge heterogeneity refers to the assorted nature of knowledge that is present within an organisation, this knowledge can be tacit or codified. This heterogeneity is crucial because it influences a firm's ability to create value and sustain competitive advantage. Heterogeneity contributes to an organisation's competitiveness because firms strive to combine and diversify different knowledge to enhance their organisational capabilities (Srivastava, 2022). The emphasis of the firm's KBV is that organisations are heterogeneous entities that are loaded with resources and their resource base increasingly comprises knowledge-based assets (Curado & Bontis, 2006).

One of the key propositions of the KBV is that an organisation exists to create, transfer and transform knowledge into competitive advantage (Curado & Bontis, 2006). Thus, in the context of DM, knowledge can be extremely valuable to the Department of Civil Protection (DCP). The DCP can benefit from access to up-to-date and accurate disaster information and knowledge that allows it other response organisations to make more informed decisions, including the efficient allocation of resources as well as improved coordination. By managing disaster information and knowledge, the DCP can leverage institutional knowledge, including lessons learned from past disasters. The DCP can utilise this knowledge to predict challenges and identify and implement best practices. The DCP can also acquire and store knowledge about the community, including indigenous knowledge (IK), community needs, available resources, assets, skills and capabilities, all of which allow the unit to tailor its response accordingly. This practice enhances the DCP's overall effectiveness in disaster response.

3.3.2 Challenges and limitations of the knowledge-based view

Organisations may mistakenly consider the higher knowledge content of products and services as an indicator in their effort to transition into a knowledge-based organisation. However, the correct approach lies in the intangible assets beneath the surface (Curado & Bontis, 2006). Although knowledge is a strategic asset that can facilitate better coordination between various organisations, there are technological and organisational arrangements that need to be put in place to ensure effective coordination (Srivastava, 2022). These includes, leveraging advanced communication technologies, multimedia technology, network-based systems, integrated software applications and fostering cross-functional collaboration within organisations to improve KS and coordination (Srivastava, 2022). The tools should facilitate seamless information exchange between the different units within the organisation. Organisational arrangements that foster coordination include focusing on creating structures that support effective KM and knowledge governance. A KM culture should be cultivated with clear lines of responsibilities, promoting continuous learning and developing mechanisms for KS (Srivastava, 2022). According to Srivastava (2022) it is crucial to first understand how knowledge is currently defined and managed within an organisation to identify gaps and limitations in the current KM practices. This practice will lead to improvements that align with the organisation's objectives. Assessment of a firm's true competitive advantage can be limited by the difficulties in accurately measuring and valuing intangible knowledge assets while collaboration can be hindered by knowledge silos.

3.4 Knowledge management overview

3.4.1 Organisational drivers of knowledge management

The most common organisational drivers of KM include the retirement of key personnel, the need to reduce costs and effort through improving internal efficiencies and the need for innovation. In DM process, common drivers include fragmented knowledge, organisational silos, a reactive culture, a lack of standardisation, institutional memory loss and information overload. Figure 3.2 below shows the key drivers of KM.





Source: (www.straitsknowledge.com, 2010)

3.4.2 KM implementation perspectives

Shujahat, Sousa, Hussain, Nawaz, Wang and Umer (2019) view KM implementation from four elements: people-centred, process-centred, technology-centred and goal-oriented. In the same line of reasoning, Oktari et al. (2020) view the implementation of KM from three perspectives: IT, people and processes.

3.4.2.1 People-centred KM implementation perspective

The people-centered group believes in the development of people, human intellect, organisations as well as management skills. This perspective acknowledges that knowledge resides within people's interactions and experiences. People hold the tacit knowledge that is critical in knowledge creation. According to this group, knowledge transfer (KT) between external partners and within the organisation is the main objective of KM (Oktari et al., 2020). This perspective, thus, prioritises the role of individuals in the process of managing knowledge. KM activities under this perspective include encouraging the creation of communities of practices (CoPs) as well as cross functional teams. The emphasis is also on fostering a culture of knowledge sharing, collaboration and continuous learning. Interpersonal open communication is strongly valued and the significance of capturing tacit knowledge is recognised. This perspective can lead to increased problem solving and innovation. However, the success of the people-centred approach relies heavily on the individual's willingness to share knowledge and, thus, may require the organisation to change its culture and behaviour. It is also challenging to quantify and measure the impact of the people-centred approach on KM.

3.4.2.2 Technology-centred KM implementation perspective

The IT perspective group believes that knowledge can be encoded, stored, transmitted and processed by IT systems, thus, IT becomes crucial in managing knowledge (Oktari et al., 2020). The focus of this perspective is on leveraging technological solutions to facilitate knowledge storage, retrieval and dissemination. The technology perspective utilises artificial intelligence (AI), search algorithms and data analytics to enhance knowledge access. The emphasis is on using various platforms, software tools and systems for KM. Priority is given to automation, digitisation and efficient information retrieval. The technology perspective often involves the implementation of intranets, knowledge bases and content management systems. In line with the IT perspective Fombad and Fombad (2018) assert that ICTs are at the centre of KM and play a key role in retrieving the varieties of tacit and explicit information and knowledge that is embodied in systems. The benefits of the technology perspective includes the facilitation of remote collaboration and communication as well as the automation of routine KM tasks. The technology perspective supports the accurate and rapid search for relevant knowledge. It enables efficient storage and retrieval of a large volume of information.

However, Tashfeen and Ahmad (2017) argue that KM solutions concentrating entirely on technologies have met with partial success because an overemphasis on technology can
neglect the human and social aspects of KM. The technology perspective requires ongoing updates and maintenance to remain effective. In addition, this perspective might not effectively capture tacit knowledge (Shujahat et al., 2019).

3.4.2.3 Process-centred KM implementation perspective

The process-centred perspective emphasises the creation of efficient and structured processes for capturing, organising and sharing knowledge within an organisation. This practice also refers to the business processes (Edwards, 2011). Priority is given to the creation of seamless information flow across the organisation. The focus is on creating clear protocols and guidelines for knowledge sharing. Emphasis is placed on standardised workflows and procedures for KM. This procedure often involves the development of documentation systems. The process-centred perspective facilitates quick access to relevant information and enhances consistency in the management of knowledge but overlooks the social and human aspects of knowledge sharing. This perspective also supports better monitoring and tracking of knowledge related processes. However, the standardisation can lead to rigidity in structures that may not accommodate creativity and flexibility. This process-centred perspective also requires continuous updates to accommodate changing needs.

3.4.2.4 Goal-centred KM implementation perspective

The goal-centred perspective aligns KM efforts with an organisation's overarching goals and objectives. This perspective gives priority to KM activities and strategies that help achieve those goals. It places heavy emphasis on knowledge related goals that directly contribute to organisational success (Shujahat et al., 2019). This perspective maximises the value and relevance of KM activities because it ensures that KM efforts have a tangible impact on the organisational goals. However, adopting a goal-centred perspective may require adjustments to KM strategies as organisational goals evolve.

3.4.2.5 Holistic approach to KM implementation

It should be noted that organisations often find success by integrating all the above perspectives and tailoring their KM strategies to their specific objectives, needs and culture. This practice concurs with findings of Rohajawati & Akbar's (2021) study which examined the relationship between people, process and technology in Indonesian hospitals. These researchers found out that an IT system is used to enable information systems that can collect, store, organise and transfer data and information. However, for successful implementation,

technology should support the needs of the KM people and processes (Rohajawati & Akbar, 2021). Similarly, Tomé, Gromova and Hatch (2022) also discovered that a crisis is solved by using technology and teaching the responders to become competent using IT. Edwards (2011) argues that without thinking about the way people, organisations, and technology actually perform activities, any implementation of a KM initiative is at best risky and at worst doomed to failure. Thus, people, processes and technology are the three basic elements in a KM implementation (Ganapathy, Mansor & Ahmad, 2019). The success of applying these KM perspectives depends on the level of understanding of the crisis context.

3.4.3 Role of KM in emergency and crisis response

Due to the evolving nature of a disaster, KM becomes a key facet in improving the responsiveness to environmental changes (Santoro et al., 2018). This view is supported by Tomé et al. (2022) who argues that KM should be at the centre of crisis management. Through the use KMS organisations can collect, organise and disseminate accurate and up-to-date crisis related information comprising data related to the resources available, affected areas and best practices for handling similar situations. KM facilitates SA and, thus, minimises the impact of disasters (Oktari et al., 2020). For example, for anticipating and understanding how the crisis is progressing, responders need shared mental models. This behaviour uses intuition and memory to support decision-making. Thus, for the creation of shared mental models, crisis management teams use both tacit and explicit knowledge (Commonwealth of Australia, 2018). KM supports decision making because the KM tools provide valuable insights and lessons learned from past crises. This knowledge enables the responders to make better decisions based on evidence and experience that helps them timeously generate problem-solving plans. Responders use tacit knowledge in the form of expertise to allow them to select the best possible action for the most effective outcome (Commonwealth of Australia, 2018).

KM facilitates the cross-fertilisation of ideas. According to Oktari et al. (2020), KM facilitates the process of acquiring, sharing and making use of knowledge. With KM, people are kept up to date and this knowledge helps them build a communal bond within the organisation. Oktari et al. (2020) argue that KM improves the effectiveness of an organisation's operations and this enhances its innovativeness.

According to Commonwealth of Australia (2018), crisis decisions should be accurately documented providing justifications for the decisions taken throughout. These documented decisions then act as institutional memory, a frame of reference for others managing the crisis and a check point for cognitive biases (Commonwealth of Australia, 2018). This process helps

in the capturing of lessons learned from the response effort allowing for continuous improvement. KM facilitates the building of organisational memory which reduces the chances of 'reinventing the wheel'. KM platforms can provide timely access to relevant training material, standard operating procedures (SOPs) and guidelines for responders to engage promptly in the learning and training necessary for achieving their goals. This process improves the organisation's flexibility and agility. KM helps diffuse best practices within the organisation and, thus, enables the organisation to solve problems quickly. KM is essential for organisations to make better decisions and increase productivity (Ganapathy et al., 2019).

For CoP, KM promotes peer-to-peer mentoring that helps individuals develop their professional skills. KM also provides a centralised information sharing and idea exchange platform and coordination. KM facilitates more effective collaboration and networking and helps individuals develop both a common language and a professional code of ethics for the organisation. It ensures that accurate information is shared consistently with all stakeholders to minimise misinformation and panic. KM also allows responders to identify potential risks and vulnerabilities before and during a crisis so that they can take proactive measures to mitigate the crisis impact. KM allows for resource optimisation.

• Impact of KM on crisis response outcomes.

In the context of crisis response, effective KM can significantly enhance outcomes such as response time, effectiveness, and community resilience. By ensuring that critical information is readily available and easily communicated, KM systems can fundamentally improve how organisations and communities address crises, ultimately leading to better preparedness and recovery.

The role of KM in enhancing disaster response outcomes is increasingly recognised in both academic literature and practical applications. One significant aspect is the integration of indigenous knowledge, which has been shown to enhance community resilience during disasters. Indigenous practices often provide valuable insights into local risk reduction strategies, as these practices are deeply rooted in the community's historical experiences and environmental contexts. Haque (2018) highlights that local knowledge is essential for improving disaster risk reduction strategies, as it allows communities to leverage their understanding of local hazards and vulnerabilities. Furthermore, knowledge sharing within communities facilitates effective disaster response and recovery, ensuring that information flows freely among stakeholders. Policymakers are beginning to recognise indigenous knowledge as a critical resource, complementing scientific approaches in DM, thereby creating a more holistic framework for addressing disaster risks. In addition to indigenous

knowledge, KM aims to reduce the impact of hazards on communities by enhancing understanding and application of disaster risk knowledge. Carby (2019) notes that effective communication is crucial for improving decision-making processes in disaster risk management. Knowledge sharing fosters collaboration among various stakeholders, including government agencies, non-governmental organisations, and community groups. This collaborative approach is essential for building capacity through training that integrates disaster risk considerations into business practices. However, challenges remain in translating data into actionable knowledge, underscoring the need for effective KM systems that can bridge the gap between information and practical application.

KM also enhances planning and response effectiveness for emergency managers. Dorasamy & Raman (2011) asserts that KM supports real-time communication and coordination during disasters, which is vital for timely and effective responses. KM systems facilitate knowledge retrieval and evolution in crisis situations, allowing responders to learn from past disaster experiences. This learning is crucial, as it can significantly reduce life and property losses during disasters. By documenting and analyzing previous responses, KM not only aids in immediate DM but also contributes to long-term improvements in preparedness and resilience. Moreover, effective KM enhances timely access to disaster response activities. Inan and Opper (2015) emphasises that improved decision-making processes are a direct outcome of structured KM practices, which support continuous learning from past experiences. The structured representation of complex DM knowledge promotes collaboration among various DM agencies, enabling them to work towards common goals with a clear understanding of roles and responsibilities.

3.4.4 Role of indigenous knowledge in emergency and crisis response

Indigenous knowledge systems (IKS), also known as community-based systems, comprise traditional knowledge, beliefs and practices that have been developed and passed down through generations within a specific culture or community (Josè Moisès, Kgabi & Kunguma, 2023; Mitiku & Hailu, 2017; Turyasingura, Turyasingura, Ayiga, Benzougagh, Kader, Singh, Bosco, Gweyi-Onyango & Bojago, 2023). The IKS are deeply rooted in the context and culture of the community and this makes disaster response and preparedness more relatable and effective within the cultural framework. It provides the community members with valuable strategies and information to anticipate, prepare for and respond to disasters, leading to more sustainable and long-lasting solutions that have been tried and tested over time (Turyasingura et al., 2023). According to Mitiku and Hailu (2017), IKS respects and acknowledges local

values, culture and worldviews in disaster response that lead to culturally sensitive interventions, thereby enhancing community resilience. Community engagement is fostered through the utilization of IKS (Josè Moisès et al., 2023).

Disaster response officials can collaborate with local communities to understand and incorporate IKS into scientific EWS. IKS can be used to supplement and validate scientific data and provide a comprehensive and holistic approach to EW. However, there is a need for education and training on how to effectively integrate IKS into scientific systems so as to bridge the gap between modern technologies and traditional practices (Turyasingura et al., 2023). According to Mitiku and Hailu (2017), in order to successfully integrate scientific knowledge and IKS, there is need for training and developing collaborative frameworks that incorporate both the IKS and scientific data for EWS (Josè Moisès et al., 2023). However, previous studies have shown that integrating IKS and scientific knowledge has not been always easy due to limited awareness of scientific systems and their terminology, differing perspectives in understanding risk information between community members and scientific experts, cultural barriers, resource constraints, power dynamics as well as validation issues (Josè Moisès et al., 2023).

3.5 Knowledge management life cycles

This sub-section describes the major KM phases. It discusses the KM life cycle models according to different authors as well as the key steps in each process. This section also describes how valuable knowledge from individuals, groups and organisations is created, captured, codified, shared, accessed, applied and reused throughout the KM life cycle and how ICTs can be used in each phase. The models aim to provide a framework for effectively managing knowledge.

3.5.1 KM life cycle models

3.5.1.1 Bukowitz and Williams (2008) KM cycle

This KM process framework by Bukowitz and Williams (2008) outlines how companies create, maintain and deploy a strategically accurate stock of knowledge to create value (Dalkir, 2013). It consists of four KM cycles or stages that help organisations effectively identify, capture and leverage collective knowledge. This framework (Figure 3.3 below) posits that KM initiatives

are embarked on as a result of tactical and strategic needs. The model provides a synopsis of the strategy behind KM.



Figure 3. 3: KM process framework Source : Dalkir (2013)

Within the KM process framework, knowledge consists of knowledge repositories, information technologies, relationships, functional skills sets, communication infrastructure, environmental responsiveness, process know-how, organisational intelligence and external sources. This knowledge can be used at a tactical or strategic level. The tactical level use is triggered by market-driven demands and opportunities and typically results in day-to-day use to respond to these opportunities or demands. Figure 3.3 above depicts the tactical use as the "get, use, learn and contribute" cycle. The strategic use comprises the "assess, build/sustain and divest" cycle and is triggered by changes in the macro environment and encompasses long-range processes of matching intellectual capital to strategic requirements (Dalkir, 2013). Thus, when an organisation fails to locate and apply the knowledge that it needs to meet the existing need, it misses opportunities and fails at a tactical level. When an organisation neglects to employ the right knowledge it fails at a strategic level.

Tactical stage processes

i. *Get:* This stage involves searching for the information needed for solving the problem at hand, making the decision or innovating. However, in today's environment in which there are volumes of information, the major challenge is dealing with the high volumes

of available information rather than accessing the information. However, various technologies are used currently to help sift through the vast volumes of content in search of valuable knowledge. It is important to understand the user's needs so that the user will receive the information necessary for making sound decisions. At this stage it is crucial to understand where the required knowledge resides.

- ii. *Use:* This stage deals with ways of combining information in new and interesting ways to foster organisational innovation amongst individuals and groups.
- iii. Learn: This phase involves the formal stage of learning from experience to create organisational memory. The organisation should learn from past successes (best practices) or failures (lessons learned) and foster OL during this process. Organisational members should take time to reflect on previous experiences after acquiring and using content because learning is essential to avoid the mistake of 'warehousing' content in the organisation without making any significant difference to the way systems are enacted within the organisation.
- iv. Contribute: This stage involves encouraging and motivating people to make visible their appropriate knowledge by posting what they have learned to the repository (the communal knowledge base) for the benefit of the entire organisation. The focus of this stage is to ensure that knowledge is not just collected and stored but rather shared across the organisation. On the other hand, this phase also guarantees that only appropriate knowledge is shared. Organisations, therefore, should ensure that there exists a generic format to ensure usage by a wider audience. Intranets also enables the sharing of information during this stage. Content that should be shared includes lessons learnt and best practices. There should be some plans in place to foster knowledge sharing. For example, the benefits of sharing knowledge to both the organisation and the individual must be perceived by all the stakeholders. The organisation must also engage the services of a knowledge broker – a professional responsible for gathering, repackaging and promoting knowledge nuggets throughout the organisation. The organisation should also ensure the deployment of an intranet that acts as an organisational memory management system that maintains the results of OL. To ensure sharing, users should be motivated by assuring them of the popularity of their contributions.

Strategic level

i. *Assess:* This stage focuses more on the group/organisation and involves evaluating intellectual capital. The organisation defines mission-critical knowledge and maps current intellectual capital against future knowledge needs. Metrics should be established to measure the growth of the organisation's knowledge base. At this stage,

the organisation identifies new forms of knowledge assets/capital such as customer capital (customer relationships), human capital (competencies), intellectual capital (relationships among customers, staff and organisational capital), and organisational capital (business process, knowledge base, culture, norms and values and technology infrastructure).

- ii. *Build and sustain:* This step ensures that sufficient resources are allocated to the growth and maintenance of knowledge, through the reinforcement of existing knowledge and creation of new knowledge.
- iii. *Divest:* This step involves an organisation in assessing its intellectual capital to determine if it is worthwhile to retain this asset. Knowledge divestiture decisions include spinning-off companies, obtaining patents, terminating employment or a training programme, ending partnerships and upgrading/replacing technology.

3.5.1.2 Wiig's KM cycle (1993)

According to Evans, Dalkir and Bidian (2014), Karl Wiig introduced the KM cycle in 1993 as a practical framework aimed at facilitating effective KM. The model encompasses four primary phases, each serving distinct purposes:

- i. *Generation*: During this phase, knowledge comes into existence through such activities as research, development and innovation.
- ii. *Retention*: This phase involves the preservation and accumulation of knowledge, incorporating it into repositories such as human minds, documentation, archives or digital storage systems.
- iii. *Distribution*: In the pooling phase, knowledge is shared and disseminated among different individuals and groups within the organisation.
- iv. *Utilization*: The final phase focuses on the application of knowledge to resolve challenges, make informed decisions, and generate value for the organisation.

Wiig's (1993) model underscores the significance of organising knowledge to enhance its practicality and worth. Furthermore, it highlights the necessity of adaptability and precision when employing any framework to represent the processes of knowledge creation and utilisation.

3.5.1.3 Meyer and Zack's KM cycle (1999)

According to Evans et al. (2014), the KM cycle was developed by Meyer and Zack in 1999 and describes the fundamental elements involved in the KM process. The model encompasses five key facets of KM:

- i. *Acquisition*: This initial stage centres on the collection of high-calibre information, ensuring its integrity for subsequent phases in the cycle.
- ii. *Refinement*: During this phase, information undergoes processing, organisation and fine-tuning to enhance its practicality and worth.
- iii. *Distribution*: This phase involves disseminating the refined information through various channels, such as electronic platforms or printed materials.
- iv. *Utilization*: In this phase, the information is put into action to address challenges, facilitate decision-making and contribute value to the organisation.
- v. *Presentation*: The concluding stage underscores the information's value by considering its context of use and the quality of the presentation interface.

These dimensions are interlinked, constituting a cyclical process wherein knowledge is garnered, enhanced, stored, shared and displayed (Supermane & Mohd Tahir, 2018).

3.5.1.4 McLeroy's KM cycle

McElroy's KM cycle encompasses four distinct phases:

- i. *Social sharing*: During this phase, tacit knowledge is exchanged through social interactions, such as storytelling, apprenticeships and mentoring.
- ii. *External expression*: This stage involves the transformation of tacit knowledge into explicit knowledge employing techniques such as metaphors, analogies and concept mapping.
- iii. *Integration*: In this phase explicit knowledge is amalgamated and harmonised to engender novel knowledge assets.
- iv. *Personalisation*: In the final stage, newly formed knowledge assets are internalised and applied to address challenges, facilitate decision-making and cultivate organisational value.

McElroy's model underscores the vital significance of tacit knowledge sharing, the conversion of tacit knowledge into explicit forms, the synthesis of explicit knowledge and the internalisation of novel knowledge assets to foster organisational value creation (Dalkir, 2013).

3.5.1.5 Evans and Ali's model (2013)

Evans and Ali's (2013) conceptual framework comprises seven distinct phases, which do not necessarily occur in a sequential order:

i. *Recognition:* During this stage, the necessity for knowledge is recognised, and if not found through search, new knowledge assets are generated.

- ii. *Storage*: This phase entails the retention, accumulation and integration of knowledge within repositories such as individual minds, documents and archives.
- iii. *Dissemination*: During this phase, the sharing and distribution of knowledge assets take place among various individuals and groups within the organisation.
- iv. *Application:* During this stage, knowledge assets are put to practical use, addressing issues, aiding decision-making and generating value for the organisation.
- v. *Learning:* This phase involves introspection on past experiences and extracting lessons from them to enhance future performance.
- vi. *Enhancement*: During this phase, knowledge assets are evaluated and scrutinised to pinpoint areas for refinement, thus, amplifying their quality and relevance.
- vii. *Generation:* The final phase focuses on the initiation of fresh knowledge assets, employing methods such as expert interviews, prototyping, information and workflow analysis, and competence and process mapping.

Evans and Ali's model presents a pragmatic and cohesive strategy for organisations to effectively oversee their knowledge assets across their useful life span.



Figure 3. 4: Evans and Ali's model

Source : Adopted from (Evans et al., 2014)

3.5.1.6 The Nonaka and Takeuchi Knowledge Spiral Model

According to Evans et al. (2014), this model is based on a study of the factors that led to the achievement of innovation and creativity by Japanese companies. The authors discovered

that the main reason for these accomplishes was the companies' tacitly driven approach and the sharing of highly subjective insights in the form of slogans, metaphors or symbols by the workers. According to these authors, knowledge creation always begins with an individual and this knowledge is then made available to other individuals within the organisation. According to Evans et al. (2014) there are four modes of knowledge conversion as shown in Figure 3.5 below.



Figure 3. 5: SECI model

Source : (Dalkir, 2013)

SECI stands for Socialisation. Extermalisation, Combination and Internalisation

- Socialisation: tacit to tacit
- Externalisation: tacit to explicit
- Combination: explicit to explicit
- Internalisation: explicit to tacit

Organisations should ensure that knowledge is not halted during any of these stages because experience, knowledge, best practices and lessons learned are engaged in all the four conversion processes. This practice occurs because it is only when internalisation takes place that people's shared mental models exist and the knowledge becomes a valuable asset. For organisational knowledge creation to take place, the tacit knowledge that is accumulated at the individual level has to be shared with the other members of the organisation through pooling experience, information, imitation, observation and practice (socialisation). This knowledge can then be made explicit through the use of metaphors, analogies and models (externalisation). The explicit knowledge can then be recombined and systemised (combination) and, once again, becomes part of an individual's experience (internalisation).

According to Nonaka (1997), knowledge creation depends on a dynamic and continuous interaction between explicit and tacit knowledge throughout the quadrant, it is not a sequential process.

3.5.1.7 KM cycles implementation challenges

Several factors can hinder the successful execution of the phases listed in each of the models described above. For example, effective knowledge acquisition, storage and sharing often requires appropriate technological tools and infrastructure. A lack of these resources can hinder successful KM implementation using any of the above models. The culture of the organisation can also harm the KM implementation because cultures that are not receptive to knowledge sharing might make employees hesitant to share their knowledge due to job insecurity fears. Employee incentives are also related to culture. Organisations embarking on KM, therefore, need to assess their cultures' readiness for this process because KM cycles usually struggle to gain traction in environments in which employees are not motivated to share their knowledge. Organisations wishing to embark on KM, therefore, should provide incentives such as rewards, recognition and opportunities for career advancement. Communication barriers within the organisations such as language differences and/or the lack of clear communication channels can impede knowledge flow. Organisations need to identify and address such communication barriers to pave the way for effective KM implementation.

Organisations wishing to embark on KM need to effectively manage change. There is a need for changes in workflows and processes. However, resistance to change from management and employees can hinder the adoption of the KM cycle. Lack of leadership support can also hinder the adoption of KM cycle because resource allocation and sustenance over time can be a challenge. Strong leadership support, therefore, is required for the effective adoption of the KM cycle. There is a need for proper metrics to assess the benefits of the KM cycle and justify the resources and efforts invested. The above challenges to the implementation of the KM cycle can be addressed by developing a comprehensive strategy that takes into account the specific context and needs of the organisation.

3.2.6 KM frameworks/models

According to Evans et al. (2014), there is a need for a framework/organising principle for classifying the different types of functions and activities to handle all knowledge-related work within and between organisations. This framework can be classified as either descriptive or prescriptive or a combination of the two. Prescriptive frameworks do not describe how procedures should be accompanied, they just prescribe different ways of engaging in KM

activities. Descriptive frameworks, however, describe or characterise KM and identify attributes of KM that are important for their influence on the failure or success of KM initiatives. This section describes the key tenets of the major KM models/frameworks currently in use and this research study recognizes the existence of many other KM frameworks not mentioned in the reviewed literature. However, Holsapple and Joshi (1999) recognise the following prominent KM frameworks: Knowledge Management Pillars; Core Capabilities and Knowledge Building; Knowledge Organisation; Knowledge Management Stages and Organisational Knowledge Management model.

3.6 Leveraging ICT to enable the KM lifecycle

The reviewed literature shows that Knowledge Management Systems (KMS) can be used to capture, evaluate, store, and assist in sharing, applying and re-using the specific crisis response knowledge which can support crisis decision making. With KMS, responders can selectively apply knowledge, thus, helping the C2 manager to decide the decisions to focus on, what information to access and study as well as the types of decisions that can be automated and/or made in advance. Thus, in a crisis, it is imperative to deploy a KM platform that collects and manages updated crisis knowledge (Harrinson, 2021). A strategic approach to KM assures that organisations possess the information and resources that they need to operate at the maximum level. Without KM processes in place, an organisation is constantly at risk of losing information if and when a crisis arises. IT has become a facilitator of KM and has the potential to effectively help the crisis response activities (Harrinson, 2021). Different authors allocate different names to these systems. Fischer-Preßler (2021), refers to the type of information that makes it possible to store, distribute, visualise and access disaster-related information as an emergency management information system (EMIS). Research has shown that future EMIS should incorporate KM because KM can handle both tacit and explicit knowledge (Dorasamy et al., 2017). Against this background, the main focus of this section is on how IT is used in the various KM processes. It also focuses on the tacit dimension of knowledge because, traditionally, IT-based KM approaches stressed the storage and distribution of explicit knowledge, overlooking the tacit dimension (Suárez, Manuel, Mentero, Arco, Martinez-martinez, Manuel & Suarez, 2018).

3.6.1 Knowledge capture and acquisition

Knowledge acquisition is the initial step in KM and entails a series of crucial steps. It is essential to acquire the right information from the right people at the right place and time. It involves extracting knowledge from various sources, such as databases and human capital, tacit and explicit (Fareedi & Ghazawneh, 2018). According to Elhendawi (2020), both human and digital sources/electronic databases exist. The purpose of knowledge acquisition is to collect knowledge from various sources (internal, external, tacit and explicit) and store it in the organisation's memory to ensure its availability for future reference (Aming'a, 2015). Crises data in different formats is collected from a multitude of heterogeneous sources, such as images, text, videos and audio recordings (Khatoon, Asif, Hasan & Alshamari, 2022). Crisis response managers must be able to combine and utilize these heterogeneous data sources and be able to use techniques to process and integrate the information intelligently to support crisis response (Khatoon et al., 2022). The knowledge capture and acquisition stage has been identified as the most critical task (Harrinson, 2021). It ensures that the appropriate information is made available to the right people when needed and, thus, it aids decision-making (Aming'a, 2015). Hence, an organisation should have robust knowledge capture and acquisition mechanisms in place to prevent the disappearance of critical information and knowledge and to strengthen its institutional knowledge base (Aming'a, 2015). This practice is also crucial when developing knowledge-based systems. Therefore, it is important to understand how to systematically capture knowledge from different sources. Thus, knowledge engineers should create strategies for capturing knowledge from the various information channels and systematically implement a knowledge acquisition and capture process (Fareedi & Ghazawneh, 2018)

According to Fareedi and Ghazawneh (2018), the modelling workshop technique can be used for knowledge acquisition. This approach can capture tacit knowledge from domain experts using techniques such as MS Visio and EKD. It is a participatory approach that unites experts, practitioners and all the relevant stakeholders to collaboratively develop representations or models of a particular process or system (Fareedi & Ghazawneh, 2018).

In the DM context, the above technique can be used for stakeholder network mapping to illustrate the actors, their roles and responsibilities and the various communication channels linking the actors. This process helps organisations identify information gaps, potential bottlenecks and opportunities for strengthening KS and collaboration within the DM ecosystem. It can also be used for knowledge mapping of disaster-related resources, to collaboratively develop a map or visual representations of the available types of data, knowledge and other resources within the DM ecosystem. The aim is to identify overlaps, gaps and opportunities for KS and knowledge integration across different stakeholders. The technique can be used to capture and document the experience and knowledge of organisations and individuals involved in disaster response and recovery. Through engagement in workshops, the participants can collectively model the various key actors, the

steps, how information flows among them and their decision-making process. This technique helps in capturing the best practices and tacit knowledge of the experienced personnel that can be documented and shared for future reference.

Other techniques for knowledge capture and acquisition include the enterprise modelling, hybrid modelling and explicit knowledge modelling techniques (Fareedi & Ghazawneh, 2018), semantic-based knowledge management system (SKMS) and Aming'a's (2015) identified expert systems as well as brainstorming and interviews.

Technologies for knowledge acquisition include:

Social media : The overarching goal of social media use in crisis response is to allow for the creation and exchange of user generated content, however, the platforms and services used may vary (Andrews, Gibson, Domdouzis & Akhgar, 2016). The use of social media is now ubiquitous and, while the services and platforms used may vary, their overarching goal is the same: to "allow the creation and exchange of User Generated Content". Crises coordination centres' offices often receive reports and comments surrounding the crises through mobile phones and this forms a large repository of real-time, unstructured crisis-related information (Andrews et al., 2016). In this era, drones equipped with sensors, are significantly increasing the situation awareness of operations in a dedicated command and control centre (CCC) (Geister, Schwoch & Lieb, 2021). This information has untapped potential, extending the responder's SA beyond the usual CCC. For organisations to benefit from the sheer volume of information recorded by drones, they need to make sense out of the data, a task which is not trivial.

3.6.2 Knowledge storage and organisation

KM provides a logical process and tools to promote access to and use of knowledge among crisis responders so as to improve crisis response outcomes (Sullivan, Limaye, Mitchell, D'Adamo & Baquet, 2015). By its very nature, crisis response requires multitudes of actors all working towards one shared goal but with different roles. Effective coordination is important to ensure successful disaster response. KM can improve crisis coordination, enhancing knowledge application and learning, improving the service quality and, ultimately improving crisis response (Sullivan et al., 2015).

• Potential of blockchain technology and IoT in DM and response

The integration of blockchain technology and the Internet of Things (IoT) presents significant opportunities for enhancing DM and response efforts. Both technologies offer innovative solutions that address key challenges in the field, particularly in terms of transparency, security, real-time monitoring, and resource optimisation.

Blockchain

Blockchain is a form of Distributed Ledger Technology (DLT) that revolutionises the recording and verification of transactions across various applications. It securely records transactions using advanced cryptographic techniques, ensuring data integrity. Each transaction is timestamped and has unique cryptographic signatures, enabling precise tracking and validation. This decentralised system relies on user consensus for verification, meaning multiple participants must agree on a transaction's validity before it is added (Peker et al., 2023).The structure of blockchain consists of linked blocks of transactions, each containing a time-stamped series of executed transactions, creating a permanent and transparent record. The data is stored in a distributed and immutable database, preventing alterations without network consensus, which enhances participant autonomy and self-governance. Various consensus mechanisms, like Proof of Work and Proof of Stake, ensure that all transactions are verified, maintaining the ledger's integrity (Peker et al., 2023).

Blockchain technology also enhances transparency and traceability, as all participants can access the same information, fostering trust and accountability. The tamper-proof nature of the data, secured by robust cryptographic methods, protects against unauthorized access. Additionally, blockchain supports smart contracts, self-executing agreements that automate processes, reduce intermediaries, and increase efficiency across sectors such as finance and supply chain management (Horrigan, 2024). Blockchain technology enhances transparency and security in DM by providing a decentralised and immutable ledger for transactions and data sharing. According to (Pour, 2021), the transparent nature of blockchain allows all stakeholders involved in disaster response to access reliable information, which is crucial for informed decision-making. This transparency not only builds trust among various actors, including government agencies, NGOs, and local communities, but also enhances accountability in the distribution of resources. Furthermore, blockchain enhances security and privacy in IoT networks by enabling secure and verifiable transactions for IoT devices. Horrigan (2024) points out that the decentralization inherent in blockchain technology improves resilience against potential cyber-attacks, which are a growing concern in IoT systems. By ensuring that data is secure and transactions are trustworthy, blockchain can facilitate more efficient operations during disasters.

The application of blockchain in DM extends to automating processes through smart contracts. These self-executing contracts automate transactions and agreements based on predefined conditions, thus reducing the need for manual intervention. This automation streamlines processes in humanitarian actions, allowing for quicker responses during crises. Additionally, the provision of secure and immutable records for various applications supports decentralised business models, transforming traditional roles within disaster response ecosystems. By removing intermediaries, blockchain not only enhances efficiency but also optimises resource allocation, ultimately improving response time during disasters.

ΙοΤ

IoT significantly improves real-time monitoring of disaster response efforts by enabling the collection and analysis of data from various sensors and devices deployed in affected areas. This capability allows responders to track the situation on the ground more accurately and adjust their strategies accordingly. As highlighted by Pour (2021), the real-time data provided by IoT devices can optimise resource allocation and enhance response times, ensuring that aid reaches those in need as quickly as possible. Moreover, IoT facilitates dynamic communication among disaster relief stakeholders, creating a networked environment where information flows seamlessly between different agencies and organisations involved in the response.

The combination of IoT and blockchain technology further strengthens DM efforts. While IoT provides the real-time data necessary for effective monitoring and response, blockchain ensures that this data is secure and trustworthy. Horrigan (2024) emphasises that this synergy can reduce downtime in critical systems, enabling more effective coordination among stakeholders. By integrating these technologies, DM systems can achieve a higher level of resilience and adaptability, which is essential in the face of evolving threats and challenges.

3.6.3 Knowledge analysis and visualisation

For emergency response managers to make sound decisions, they need to use computational power to access the aggregated data that will enable them to make definitive decisions based upon the key features and relationships that have been presented (Andrews et al., 2016).

3.6.4 Knowledge transfer, sharing and dissemination

According to Edmonstone (2018), an organisation needs a well thought out approach to enhance its absorptive capacity, that is defined as the ability to recognise the value of new,

external knowledge, assimilate it and apply it effectively to improve DM and response. Thus, an organisation should have mechanisms in place that cultivate and enhance its absorptive capacity. OL occurs when the organisation improves its operations based on institutional knowledge and past experiences (Oh & Han, 2020). This process leads to continuous improvement. However, to ensure effective OL, the organisation needs to encourage the free exchange of information and ideas between and within teams through the establishment of technological platforms. The organisation should invest in robust organisational memory systems to institutionalise its knowledge and aid in OL for future disaster response (Presbitero, Roxas & Chadee, 2017). The organisation should put in place learning processes and knowledge-sharing systems (Oh & Han, 2020). Similarly, Esser and Janus (2023) identify CoP and spontaneous situational learning of KS as mechanisms that organisations can use for KT and dissemination. In the same vein, Chiponde, Gledson and Greenwood (2022) recommend building internal systems for learning from failures, this process should facilitate after-action reviews (AAR) and lessons learnt. Mechanisms should be in place to share AAR and the identified lessons.

Cross boundary collaboration – boundary spanning in disaster response

Boundary spanning refers to the process whereby teams or individuals interact and connect across the boundaries of different organisations or departments (Qi, Li & Wang, 2022 According to Wukich, Siciliano, Enia and Boylan (2017), boundary spanning refers to behaviours through which an organisation reaches across its traditional boundaries to interact with other organisations for information and resource seeking. Likewise, boundary spanning is defined as a process whereby individuals from different organisations bridge their organisational gaps by working together to achieve a common goal. It involves building bridges and creating connections across organisational lines to enhance cooperation and effectiveness in responding to emergencies (Curnin, 2015).

Boundary spanning allows an organisation to expand its network and knowledge base (Qi et al., 2022). It sanctions organisations to tap into opportunities that may not be available within their immediate environments. Through boundary spanning, organisations can form connections with key players leading to enhanced collaboration and innovation within networks (Wukich et al., 2017). Similarly, boundary spanning facilitates effective multi-agency coordination during crises by enabling communication and collaboration across organisational boundaries (Curnin, 2015).

During a crisis, personnel such as liaison officers act at the boundaries of their organisations. They act as interfaces between different organisations during crises and these are known as boundary spanners. According to Curnin (2015), boundary spanners play the role of an ambassador, facilitating communication and cooperation between multiple response organisation. They also act as task coordinators across different organisations to ensure alignment of efforts. Their role is to gather important information, monitor situations and provide updates to all the involved parties to enhance SA and response preparedness. They also serve as a guard, ensuring that decisions made are in line with their organisational priorities, protecting the interests of their organisation. Their major role includes effectively communicating across organisational boundaries to ensure effective information sharing and coordinated response. Boundary spanners should also be respectful of diverse perspectives and culture. They can work across various organisations, facilitating KT within and between organisations (Qi et al., 2022). Their role requires them to navigate technological, administrative, cultural and other boundaries to ensure seamless coordination in crises (Curnin, 2015).

Several factors influence an organisation to perform boundary-spanning activities. These include the attributes of the top management team, such as their functional expertise and experience in boundary-spanning activities, the culture of the organisation including that of teams (Qi et al., 2022). According to Wukich et al. (2017), the following factors influence boundary spanning: knowledge-sharing agreements, the impact of IT-facilitated networks and communication challenges. Similarly, Curnin (2015) identified the following factors as affecting boundary spanning: differences in organisational cultures as individuals try to navigate through cultural differences, personal relationships between individuals from different organisations, communication, availability of resources such as information sharing platforms, leadership support within and across organisations, training and development of boundary spanners on how to effectively navigate organisational boundaries, the flexibility and adaptability of organisations and their boundary spanners to handle changing circumstances, and the availability of common goals and shared objectives among organisations involved in multi-agency coordination.

Knowledge Sharing and Distribution

The following are inter-organisational mechanisms for KT:

Trust based knowledge governance mechanism: In this mechanism, trust is the crucial component that fosters a positive atmosphere for KT between organisations. Trust should be established to mitigate conflicts and misunderstandings during the transfer processes (Fang, Yang & Hsu, 2013). Trust can be achieved through long term interaction as well as having shared values.

Reciprocity-based knowledge governance mechanism: This mechanism is used to build reciprocal relationships between partners in which partners gain from each other's commitments. In this mechanism, parties both give and take (Fang et al., 2013).

Norm-based knowledge governance mechanism: In this mechanism, parties set norms for KT that should guide how knowledge is transferred. It is a way of building social bonds between organisations, ensuring KT. The norms should guide behaviour, providing a framework for KT activities within and between organisations. This process ensures reliability, consistency and ethical conduct in their knowledge exchange processes (Fang et al., 2013).

Knowledge networks and collaborative networks

The interconnected relationships among entities such as organisations or individuals to share, access and combine knowledge is defined as a knowledge network (Shi, Zhang & Zheng, 2019; Vordos, Gkika, Maliaris, Tilkeridis, Antoniou, Bandekas & Ch. Mitropoulos, 2020). Similarly, (Ritala et al., 2023)Ritala et al. (2023) define the term as a social network, comprised of collectives or individuals, interconnected by social relationships, that facilitates the creation, acquisition and transfer of knowledge among different actors.

Knowledge networks highlight the importance of combining knowledge elements because organisations that are embedded in knowledge networks can enhance their knowledge base (Shi et al., 2019). According to Ritala et al. (2023) network members benefit from knowledge generativity, cross-domain discovery and accumulation of social capital.

The role of stakeholders and partnerships in knowledge management during crisis response

Partnerships play a crucial role in enhancing collaboration across different sectors during disasters. By bringing together government agencies, non-governmental organisations (NGOs), private sector entities, and community groups, partnerships facilitate the sharing of expertise and resources necessary for effective disaster responses. Vinson et al (2021) notes that established relationships among these diverse stakeholders improve coordination in future disaster responses, ensuring that efforts are more organised and efficient. Moreover, partnerships allow for a division of labor, which is particularly beneficial for managing complex tasks that arise during disaster situations. This collaborative approach can also help overcome communication challenges, ensuring that all parties are informed and can act swiftly in crisis situations. In addition to operational efficiency, partnerships significantly enhance community disaster preparedness and response efforts. Academic institutions, for instance, provide valuable resources and research that inform DM practices. According to Seifi et al (2019),

collaboration between universities and emergency management agencies improves the effectiveness of public health initiatives, particularly during epidemics or natural disasters. Shared training opportunities between academic and emergency management personnel not only enhance skill sets but also foster a culture of preparedness within communities. Furthermore, universities contribute to community resilience through educational programs and support initiatives. These partnerships facilitate knowledge sharing and the dissemination of best practices in DM, ultimately leading to more robust community responses.

The integration of practice and community through partnerships enhances the overall effectiveness of DM. Malalgoda et al. (2015) emphasises that effective partnerships improve disaster resilience by facilitating knowledge sharing between academic institutions and local communities. This integration strengthens disaster education programs, ensuring that community members are better equipped to respond to emergencies. Collaborative efforts also lead to better resource allocation during disasters, as stakeholders can pool their resources and capabilities to address specific needs more effectively.

Moreover, partnerships contribute to reducing institutional and policy failures during disasters. Banugire (2018) highlights that effective collaboration enhances knowledge sharing, which is critical for improved crisis management. Community involvement within these partnerships strengthens local resilience and self-reliance, empowering residents to take an active role in their own disaster preparedness and recovery efforts. Additionally, partnerships can promote inclusive economic growth in the aftermath of disasters, ensuring that recovery efforts benefit a broader segment of the population.

3.6.5 Institutionalising KM

3.6.5.1 Categories of knowledge assets

An essential function and one of the first steps of KM is to identify and classify the different categories of knowledge assets (KA) within an organisation. Shannak (2012) defines a KA as the intellectual capital of an organisation that includes the knowledge, expertise, skills and experience of its employees, as well as its documents, databases and other information resources. The ultimate goal of identifying and categorising KA is to ensure that the organisation maximises the strategic value of its knowledge assets by developing a tailored strategy for the practical application of this knowledge. According to Nazim and Mukherjee (2016), the varying disciplinary focuses have led to the development of numerous knowledge categorisations related to the different types of knowledge assets and these categorisations

are rooted in each discipline's worldviews and assumptions. However, the following categories are common knowledge assets:

Tacit, explicit and cultural knowledge: Nonaka and Takeuchi classified knowledge as either tacit or explicit. Tacit knowledge is the knowledge that is in the mind of an individual, internal to the holder only, not documented anywhere and difficult to share with others (Nazim & Mukherjee, 2016). Tacit knowledge can be information embedded in the heads of the employees that could have been acquired through both learning and the experience gained when carrying out their duties. These are the unique skills, capabilities and competencies that the employees possess. This knowledge can give an organisation competitive advantage over its competitors. Explicit knowledge can be codified in the form of organisational information in databases, manuals and reports, together with intellectual property that the organisation possesses. Explicit knowledge is written down information that is not tied to anyone and can be stored in data repositories and distributed as required (Nazim & Mukherjee, 2016). However, the possession of either tacit, explicit or both forms of knowledge within an organisation is not the crucial factor, rather it is the effective transfer of documented information as well as the knowledge embedded in the minds of the employees. Cultural knowledge pertains to shared beliefs and practices within a group (Nazim & Mukherjee, 2016). It includes traditional practices and customs, the language, dialects and nonverbal communication unique to a culture, the fundamental assumptions, perspectives and ways of understanding the world that shape a culture, and the social norms and etiquette that shape what is deemed to be correct behaviour within a cultural context as well as the IK that has developed organically within a cultural community.

Scientific and practical knowledge: Scientific knowledge is discovered through systematic research such as experimentation, observation or rigorous analysis. Its purpose is to build a comprehensive and objective understanding of a phenomenon based on empirical evidence. It is theoretical and abstract. In contrast, practical knowledge is more pragmatic, applied, context-dependent 'know-how' that is required to effectively navigate and succeed in the real world. It is gained through the accumulation of an individual's context specific information, experience, techniques and skills. The focus of practical knowledge is to complete tasks and solve real world problems (Nazim & Mukherjee, 2016).

Declarative and procedural knowledge: Both these types of knowledge are stored in the human mind. However, declarative knowledge is factual and can be explicitly declared and stated, it is characterised as "knowing that" something is the case. This type of knowledge is easily communicated and memorised. In contrast, procedural knowledge is often implicitly

stated or described as "knowing how" to do something. It involves the abilities, skills and stepby-step sequences for performing a particular activity or task. Procedural knowledge is not easily communicated and is acquired through experience, practice and the development of both physical and automated cognitive processes (Nazim & Mukherjee, 2016). Both forms of knowledge are essential for human functioning.

Objective and experiential knowledge: Objective knowledge refers to the data, facts and information that are considered true and independent of personal experience and individual perspective. This knowledge is obtained through impartial methods of inquiry such as logical reasoning and scientific research. Experiential knowledge is rooted in the individual's lived experience, observations and direct personal encounters (Nazim & Mukherjee, 2016). This knowledge is context subjective and shaped by the individual's unique perspectives and interpretations.

Incorporated, migratory, embedded and codified knowledge: According to Nazim and Mukherjee (2016), incorporated knowledge refers to the skills, expertise and know-how that are deeply embedded within an organisation's routines, processes and culture and often exists as tacit knowledge possessed by the individuals within the organisation. Migratory knowledge refers to the transferable knowledge that can easily be communicated, shared and transported between organisations and individuals such as training manuals, documented procedures, SOPs, manuals or explicit data. Embedded knowledge is intricately tied to a specific environment, context or a set of relationships which makes it difficult to extract or apply in different settings. Codified knowledge is knowledge that has been formally documented, organised and structured in the form of reports, databases or other explicit formats that allow it to be more easily accessed, distributed and leveraged across the organisation.

Core, advanced and innovative knowledge: Core knowledge refers to the fundamental, well-established and widely accepted skills and information that form the foundation of a particular discipline. This knowledge is required for basic understanding. Advanced knowledge represents the in-depth specialised expertise and insights that go beyond core knowledge. It is often built over years of research and experience within the specific area. Innovative knowledge refers to the novel, cutting-edge and transformative discoveries, ideas and approaches that push the boundaries of existing knowledge (Nazim & Mukherjee, 2016). It has the potential of improving current practices.

3.6.5.2 Common KM objectives

A good KM strategy must target one or more of the following objectives. The most common KM objectives are innovation and reuse (Dalkir, 2013). According to Dalkir (2013), innovation does not occur in isolation but depends heavily on both positive and negative experiences accumulated over time – experience of what has worked and what has not worked in the past.

3.6.5.3 Knowledge audit

A knowledge audit (KA) is also known as the diagnostic stage and ensures that the organisation's core characteristics are well understood so that they will be taken into account when proposing KM recommendations (Dalkir, 2013). This process identifies the knowledge owner, knowledge users, the uses of the knowledge and the key attributes of the knowledge assets. A knowledge audit is usually carried out in conjunction with a KM assessment as part of the KM formulation. According to Dalkir (2013) results from a KA usually address the following questions:

- What are the knowledge needs of the organisation? What are the major differences between the desired and the current KM state?
- Is there a gap between the knowledge needed by the organisation and the available knowledge? What is the gap and where is it located?
- What are the core knowledge assets of the organisation and how does the knowledge flow within the organisation? Who creates and who uses the knowledge?
- What areas of information policy and ownership can be improved?
- Are there opportunities for reducing information handling costs and how can these opportunities be utilised?
- Are there opportunities for improving access to commonly needed information as well as coordination?

The next step is gathering the KM objectives to be addressed by the organisation through interviewing senior management as well as setting up focus groups with divisional managers. The brainstorming sessions take the form of future visioning sessions. Typical questions for attaining objectives include questions to determine the typical problems/issues that responders would want to resolve immediately and the major changes that can be embarked upon that will have a positive significant impact on the organisation's effectiveness and efficiency. Validation of gap analysis results should be undertaken by returning to the same stakeholders who participated initially in this process. Priorities should be determined by a consensus of key stakeholders. The result of these processes will form a KM strategy that acts as a road map for KM implementation of short-term initiatives. A KA also helps the

organisation determine the best solutions and most appropriate tools to enable better KM by knowledge workers in the organisation. Before any KM initiative, it is important to consult with the knowledge workers because they are the ones who will work with the systems. Thus, the KM health of an organisation should first be assessed before embarking on any KM implementation.

3.6.5.4 Developing a KM strategy

The increasing significance of knowledge as a pivotal asset has prompted managers to enhance their focus on their firms' KM strategy Nadizadeh, Sabzevari Zadeh & Sahraeian, (2011). KM strategy provides the basic building blocks that organisations can use to achieve continuous improvement and OL to avoid 'reinventing the wheel' and continually repeating the same mistakes (Evans et al., 2014). According to Nazim and Mukherjee (2016), a KM strategy assists in determining the most valuable KM approaches for the organisation based on the available knowledge resources. The KM strategy, involves defining KM goals and objectives, identifying the organisation's KA that needs to be managed and developing a plan to manage them efficiently (Shannak, 2012). It is advisable to identify and prioritise the most appropriate KM initiatives, tools and approaches that align with the objectives of the organisation.

A good KM strategy should identify the key issues and needs within the organisation and then provide a framework for addressing them. The KM strategy assists an organisation to develop a road map that it can use to identify and prioritise KM initiatives, approaches and tools in a way that supports the business objectives (Dalkir, 2013). The KM strategy should be aligned with the overall strategy of the organisation and should reflect the importance of knowledge in achieving its goals and objectives. Thus, an organisation's KM strategy should provide channels for the free flow of ideas so that knowledge can be shared and leveraged across the organisation. According to Nazim and Mukherjee (2016), KM strategy has three critical components namely people, process and IT as previously explained in section 4.4.2 of this document. This opinion concurs with that of Shannak (2012) who identified various approaches for pursuing an effective KM strategy in organisations. Shannak (2012) asserts that the main components of a KM strategy should include: a list of a company's KA or knowledge resources that exist internally or externally, as well as generic knowledge intentions to exploit existing internal information, acquire existing external knowledge and create new knowledge. It should contain a description of how a company intends to manage its KA, including methodologies, processes and technologies, i.e., a collection of KM activities that directly or indirectly support those knowledge intentions. Likewise, Dalkir (2013) points out that a good KM strategy consists of the following components: a clearly articulated organisational strategy and objectives, a description of knowledge related organisational issues such as the need for innovation, collaboration, performance variance or even addressing information overload. It should also include an inventory of the KA. Based on this inventory, the KM strategy should contain a description of recommended knowledge leverage points that defines what can be done with the previously identified knowledge and knowledge artifacts. It should list KM initiatives that can be undertaken with the goal of maximising ROI and business value (Dalkir, 2013). According to Dalkir (2013), in developing a KM strategy, one has to understand the organisation in terms of the "as-is state" (current state) and the "to-be state" (its desired business outcome). The gap analysis is the difference between the "as-is" and the "to-be" scenarios. The means of getting to the "to-be" from the "as-is" states is known as the KM strategic road map. A KA becomes a valuable tool for developing the strategic roadmap.

Components of a KM Strategy

According to Nazim & Mukherjee (2016), KM strategy should have three critical components: people, processes and IT. Thus, an organisation should assess its people and culture, the processes and strategies for capturing, storing and utilising knowledge as well as the IT infrastructure, tools and support for knowledge capture, storage, KS and collaboration. According to Jennex (2012), a KM strategy should identify the following aspects: the goals and expectations of the KM initiatives, the type of knowledge to be captured, the sources of knowledge, how the captured knowledge will be stored, the users of the KMS, how leadership support will be generated, how knowledge will be added, removed and modified to the KMS. The KM strategy also should clearly articulate the metrics for knowledge use and provide feedback mechanisms for effective knowledge use (Jennex, 2012).

Structure of a KM strategy document

KM strategy should contain both prescriptive and diagnostic content. Recommendations should be given clearly explaining the resource needs for each recommendation such as human resources and the required skills set as well as costs. According to Dalkir (2013), KM strategy document should include the following (Table 3.1 below):

ſ	Section	Title	Description
	i.	Document	Contains information about the authors, their details, date
		information	last revised, distribution limits and authority owners.

Table 3.	1:	KΜ	strategy
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ii.	Executive	A summary of the whole document	
	summary		
1.	Introduction	Sets the context of the organisation, the business drivers	
		that led to the requirement of KM	
2.	KM audit findings	Interview findings, inventory of what exists, potential of KM	
		barriers and enablers, KM maturity assessment	
3.	KM objectives	KM wish list – a prioritised list based on a consensus of key	
		stakeholders. The envisioned KM organisation	
4.	Gap analysis	Presents how far apart the envisioned future is from the	
	findings	existing and ranks the difference from least to greatest.	
5.	Recommendations	The major areas for implementation clearly state action	
		items by who, when and how. This statement should	
		clearly explain short-term and long-term action plans	
6.	Conclusions	Identifies the next plan, governance and when next the	
		strategy will be updated	
7.	Appendices	Includes all data gathered to allow the reader to check and	
		find justification if needed	

3.6.5.5 KM governance

According to the KBV of the firm, knowledge is the most important strategic resource as such, it should be managed and governed just like any other resource to ensure sustainable and competitive advantage (Curado & Bontis, 2006). Similarly, Srivastava (2022) argues that effective knowledge governance ensures proper utilisation and management of knowledge resources and this impacts the overall effectiveness of the organisation. Knowledge governance involves the structures and processes put in place to manage and share knowledge. Knowledge governance mechanisms are the concrete and underlying management and control activities that provide a detailed description of how partners should behave, and how they become influenced, motivated and established. It refers to the processes, structures and mechanisms that are put in place to effectively coordinate and manage knowledge-related activities and interactions within a network or organisation. It involves putting in place policies, incentives, rules and decision-making procedures to guide how knowledge is managed across the knowledge life cycle. Its focus is to form practiceoriented and self-organising learning through which knowledge is collectively created in communities in a social and interdisciplinary way (Gerritsen, Stuiver & Termeer, 2013). These communities are characterised by being internally diverse, open, mobile and having a shared identity. Boundary management plays a key role in knowledge governance because it facilitates social and policy learning (Gerritsen et al., 2013). Governance mechanisms help in reducing conflicts and misunderstandings during KT processes and they encourage knowledge communication. According to Gerritsen et al. (2013), there exist different types of governance that actors can utilise to implement the knowledge effectively for decision making. These include self-governance, hierarchic and network governance

• Self-governance

In DM, self-governance refers to the affected community's ability to organise and coordinate their own response and recovery effort without over-relying on aid agencies and external authorities. Self-governance empowers the local stakeholders to leverage their resources, knowledge and social networks to address immediate and pressing needs (Gerritsen et al., 2013). This approach recognises that the locals have the greatest understanding of their priorities, capacities and vulnerabilities during disaster situations. Self-governance improves DM as locals devise context-specific solutions.

• Hierarchical governance

In the realm of DM, the hierarchical governance model is one in which C2 structures and decision-making authority are centralised at the national level. Local authorities are expected to follow pre-established directives and protocols. It is characterised by standardised procedures, clear chains of command and deployment of resources according to a centralised plan (Gerritsen et al., 2013). However, this process can lead to rigidity, a disconnect between the needs of the affected communities and the decisions by the distant authority and slow response times. Overreliance on this model inhibits the ability of emergency responders to adapt to unique and context specific disaster scenarios, exhibit local flexibility and community engagement (Lin et al., 2006).

Network governance

In the context of DM, network governance emphasises decentralised structures and collaborative processes that enable stakeholders to coordinate their resources and efforts (Gerritsen et al., 2013). Unlike relying on authority, network governance involves coordinating multiple stakeholders, each contributing their unique capabilities and local knowledge. It facilitates information sharing, joint decision making and the pooling of resources across organisational boundaries. However, the success of network governance depends on strong trust building, relational skills and the alignment of diverse interests towards common goals.

3.6.5.6 Sustaining KM initiatives

• Organisational learning (OL) in disaster response

OL is defined by Esser & Janus (2023) as a process through which an organisation modifies its mental modes, rules and processes to enhance performance. It achieves this objective through transforming individual knowledge into organisational goals. Similarly Oh and Han (2020) define OL as a dynamic process within the organisation that involves the transfer of learning outcomes from individuals to the organisation and vice versa. Along the same lines, the term is defined as involving the development of knowledge, insights and associations between past and future actions. OL helps organisations to be effective, especially in knowledge-intensive industries (Presbitero et al., 2017). OL involves learning from errors, problems, and disturbances, evaluating past behaviours and reinventing new ones (Chiponde et al., 2022). According to Edmonstone (2018), OL refers to the process of creating, retaining and transferring knowledge within and between organisations. OL plays a crucial role in disaster response because it allows an organisation to adapt its strategies based on past feedback and experience and detect and correct any problems, weaknesses or errors that may arise in disaster response (Esser & Janus, 2023). With OL, an organisation can learn from failures leading to more effective and lasting improvements (Chiponde et al., 2022). Other authors (Oh & Han, 2020; Presbitero et al., 2017) state that OL allows the organisation to learn from past experiences, improve future responses, effectively transfer of knowledge and, thus, adapt quickly.

Barriers and challenges to organisational learning in disaster response

A number of barriers affect OL in disaster response leading to ineffective response. These challenges include hoarding of knowledge due to a lack of trust among responding organisations, inadequate information-sharing mechanisms and communication channels hindering knowledge dissemination, a culture that is not supportive of learning in which learning from failures is punished (Presbitero et al., 2017). Correspondingly, Oh and Han (2020) identified a lack of leadership support and commitment to learning, inadequate communication channels and KS mechanisms, a rigid organisational culture and resistance to change as barriers to OL. Findings by Esser and Janus (2023) revealed that OL may be hindered by the need for organisations to portray success externally, leading to inconsistency between actual learning outcomes and external perceptions. Chiponde et al. (2022) observed that, in some cases, failures may be hidden or externalised, hindering OL. Competing business goals may also pose challenges to engaging in AARs, that are crucial for facilitating learning for both individuals and organisations (Parker, 2020).

3.7 KM frameworks and models

3.7.1 Inukshuk KM model

A notable instance in the realm of organisational KM is the Inukshuk model that was conceived by Girard in 2005 and has primarily served as a point of reference. Initially employed to quantitatively assess the KM process within the Canadian military organisation, the Inukshuk model stands out as a significant case study. This model comprises elements such as technology, leadership, culture, process and measurement, all of which can aid organisations in optimising the returns from their investments in knowledge (Figure 3.6 below). The Inukshuk model has gained extensive recognition and is closely linked to KM within Canada (Girard, 2005).



Figure 3. 6: Inukshuk model Source : Adopted from Girard (2005)

Technology: This section pertains to the utilisation of technology for the purpose of bolstering KM within organisational settings. Technology encompasses the deployment of various tools and systems to capture, store and distribute knowledge, alongside leveraging technology to

enhance communication and foster collaborative interactions among staff members (Girard, 2005). In crisis response, technology plays a pivotal role by facilitating communication, information sharing and coordination among various stakeholders. Utilising technology tools such as communication platforms, data-sharing systems and real-time information dashboards can help manage knowledge flow efficiently during a crisis.

Leadership: This enabler of the Inukshuk model underscores the significance of effective leadership in bolstering KM within organisational contexts. Leadership encompasses the leaders' responsibility to cultivate a culture that emphasises sharing knowledge and fostering collaboration, as well as their capacity to offer guidance and backing for KM endeavors (Girard, 2005). Leadership, therefore, plays a crucial role as a catalyst for KM.

Culture: The cultural component of the Inukshuk model highlights the significance of fostering a culture that places a premium on both KS and collaborative efforts within organisations (Girard, 2005). Culture encompasses the influence of organisational culture in advancing the dissemination of knowledge and ideas, as well as the crucial nature of cultivating a nurturing atmosphere to facilitate KM undertakings. The establishment of a robust organisational culture that highly esteems KS and collaboration stands as a fundamental requisite for the achievement of successful KM. Crisis response frequently entails cross-functional and interagency coordination. Developing a KS culture is critical for effective response initiatives by encouraging different teams, companies and experts to share their views and experiences to make better decisions.

Process: The process enabler refers to the importance of having effective processes in place to assist KM in companies. This includes the creation of systems for capturing, storing and sharing knowledge, as well as the necessity of having clear standards and procedures in place for KM efforts. Effective methods are required for successful KM (Girard, 2005). Crisis response necessitates streamlined information exchange, updating and dissemination procedures. Well-defined processes for information collection, validation and distribution can improve the speed and accuracy of response activities. Furthermore, strategies for capturing knowledge gained and lessons learnt during and after a crisis can assist with continual improvement.

Measurement: The measurement enabler in the Inukshuk model highlights the significance of assessing the success of KM endeavours within organisations. This process involves devising metrics and indicators to monitor advancement and gauge the influence of KM initiatives. Grasping the effects of such initiatives is crucial for organisations to optimise the

returns from their investments in knowledge (Girard, 2005). According to Sudibjo, Aulia & Harsanti et al, (2022), the Inukshuk model explains that OKM is supported by three sources: human capital (the knowledge, skills and abilities of individuals within the organisation), structural capital (the infrastructure, processes and systems that support knowledge management) and social capital (the relationships, networks and culture that facilitate knowledge sharing and collaboration within the organisation).

Adapting the Inukshuk KM model to crisis response necessitates taking into account the unique problems and needs of such situations. The model's emphasis on teamwork, clear communication and effective decision-making corresponds to the requirements of crisis response activities. Organisations and responders can effectively exploit knowledge by following the model's principles to lessen the effects of the crisis, make informed decisions, and improve their overall response skills. The Inukshuk KM model proves adaptable and effective for application within crisis response scenarios, facilitating the efficient management and utilisation of knowledge. The demands of crisis response necessitate swift decisionmaking, collaborative efforts and the exchange of information among diverse stakeholders. By integrating the principles of the Inukshuk KM model, organisations and responders can harness knowledge to effectively mitigate crisis impacts, make well-informed choices and enhance their overall response proficiency. It is worth highlighting that crises are dynamic and demand a flexible approach. While the Inukshuk KM model can serve as a guiding framework, its implementation must be customised to suit the unique crisis context, the characteristics of the information at hand, and the resources allocated for knowledge management undertakings. The constituents of the Inukshuk KM model can be harmonised with specific facets of crisis response, thereby amplifying KM within such circumstances.

3.7.2 Choo sense-making model

As cited in Dalkir (2013) the Choo sense-making model was developed by Choo in 1998. According to Choo, those organisations that strategically use information are known as "knowing organisations". Knowing organisations use information in the context of three interconnected processes as shown in Figure 3.7 below.



Figure 3. 7: Choo's sense-making model

Choo's model is applicable in crisis management because it can be used to explain the information flow processes in crisis coordination and response.

- Sense making: The goal of this process is to ensure that the organisation will seek and interpret relevant information. This practice will enable it to understand the changes and trends in the environment and, hence, adapt and continue to prosper in a dynamic and complex environment. In emergency response, the sense making stage entails response agents making choices as to which messages to include, exclude and prioritise. In emergency situations, choices are influenced by emotions and time limits, they are made under stressful situations. Information sharing and interpretation of the information are undertaken concurrently. Effective decision making, therefore, depends on this stage (Sederholm et al., 2021).
- Knowledge creation: This process allows an organisation to acquire or create, organise and process information to generate new knowledge through OL. This new knowledge reveals the organisation's "potential to act". In emergencies, tacit knowledge and explicit knowledge are combined to modify knowledge. This knowledge creation depends on the alliances and links that have been created with other partners. Leadership plays an important role at this stage of knowledge sharing (Sederholm et al., 2021).
- Decision-making: This process results in the organisation's commitment to action.
 Decisions are made based on the shared understanding of the organisation's goals for the organisation. It is important at this stage to avoid information overload and to

identify the information needs of partners so that the correct information is shared for decision-making (Sederholm et al., 2021).

3.7.3 Knowledge ecosystem framework

The knowledge ecosystem framework is a tool that organisations can use to align a knowledge network with business goals. It represents the different competencies and their relationships within the network (Chaves Gattaz, Cruvinel & Bernardes, 2016). It allows stakeholders to graphically show the various elements of the knowledge network, such as the roles, data, agents, time, network and motivation from different points of view. In a knowledge ecosystem, stakeholders collaborate to exchange knowledge and disseminate information (Rådberg & Löfsten, 2023). The framework emphasises the grouping of stakeholders around knowledge exchange to create new knowledge effectively.

DM requires a diverse set of stakeholders and as such, the knowledge ecosystem framework helps the DCP to gain insights into the dynamic interdependencies, interactions and emergent properties that shape the flow and application of critical knowledge during disasters. The framework allows the DCP to identify key actors in disaster response and management, the information pathways as well as the institutional arrangements that hinder or facilitate KS, decision making and agility.

3.7.4 Framework of KM pillars

In 2003 Stankosky developed the four pillars of KM framework that organisations intending to embark on KM initiatives should consider for the effective management of knowledge. The four pillars are leadership, organisation, technology, and learning (Figure 3.8 below). The leadership pillar focuses on strategically aligning KM initiatives with business objectives. The organisation pillar focuses on redesigning and aligning processes and procedures. The technology pillar focuses on setting up an enabling technological infrastructure to support the KM initiative. The learning pillar focuses on ways in which the organisation creates a learning community (Stankosky, 2005).



Figure 3. 8: The four pillars of knowledge management

3.8 KM strategies for crisis response

This section seeks to answer two main questions: (1) "What are the challenges that arise when creating SA in a dynamic and multi-organisation situation" and (2) "What are the KM strategies and techniques that are used by crisis response organisations to raise SA and ensure effective coordination and collaboration and, thus, enable effective and efficient crisis response?". The section seeks to highlight KM strategies that can be adopted by the CCC to ensure effective coordination and foster inter-organisational collaboration to save lives and property.

KM initiatives or KM strategies are efforts undertaken by organisations to efficiently manage and make use of their knowledge resources (Chua, 2009). KM strategies or initiatives enable an organisation to convert data and information into relevant knowledge that will meet the objectives of the organisation (Fombad & Fombad, 2018). Thus, it is important to understand the KM strategies that can be built and adopted by emergency responders in managing disasters (Tashfeen, 2017). KM plays a pivotal role in facilitating effective and efficient response to disaster response. To make sound situational awareness, stronger communication, coordination and collaboration, it is important to understand the KM strategies, initiatives and techniques that support seamless communication solutions for enhancing situation awareness in disaster response. A study by Chaturvedi and Singh (2021) aimed to enhance India's response to the COVID-19 pandemic. They proposed five KM strategies: integrating technology and involving stakeholders, creating a pandemic knowledge repository for distribution, implementing a knowledge-based approach, defining a community-centred strategy for prevention, and fostering trust in networks for sustainable progress. Andrea (2016) carried out a study to provide insight into KM initiatives that can be implemented in SMEs. The researcher identified the following aspects: developing an easily accessible and efficient KMS, promoting the generation and exchange of knowledge among staff members, offering training and educational opportunities to enhance employees' skills and knowledge, utilising management tools and systems to facilitate effective business operations, prioritising the transfer of expertise from seasoned personnel to newcomers for knowledge continuity, as well as leveraging business and competitive intelligence to enhance competitiveness. Siddique (2012) examined the KM endeavours of business entities in the United Arab Emirates (UAE). Their research revealed that the majority of KM initiatives within UAE firms concentrate on explicit knowledge, which is knowledge that can be readily systematised and transmitted using technology. These companies dedicate substantial resources to developing their ICT infrastructure to bolster KM practices. Nevertheless, there is a relative lack of attention given to tacit or implicit knowledge, which is intricate knowledge used to formalise and transfer information. Various authors have grouped KM initiatives differently as highlighted in the section below.

Sveiby (2001) in his framework, categorised KM initiatives into the following three categories: Internal structure initiatives (these initiatives include capturing tacit knowledge, building a knowledge-sharing culture, storing, spreading and reusing the captured tacit knowledge, measuring knowledge-creating processes, intangible assets produced and revenue from existing knowledge), external structure initiatives (these initiatives include offering customers additional knowledge as well as gaining knowledge from customers and external stakeholders) and competence initiatives (These initiatives involve creating career-based KM as well as creating microenvironments for the transfer of knowledge, learning from pilot projects and simulations).

Other researchers (Dalkir, 2013; Oktari et al., 2020; Shujahat et al., 2019) view KM strategy in three parts as explained in section 3.4.2.

 People: activities include CoPs – organisations can identify those CoPs that are strategically important, fund them and raise their visibility for stronger collaboration amongst the professionals.
- Process: activities include investigating how people go about the KM processes and how they capture, organise and reuse the knowledge.
- Technology: this component acts as an enabler to KM processes.

This section focuses on KM's use during the disaster response phase, specifically focusing on SA. The researcher did not restrict the search to recent years since the literature survey seeks to understand how KM has been used in ensuring crisis coordination and collaboration. Table 3.2 below shows the empirical studies by various authors revealing the KM challenges encountered in creating SA as well as the KM strategies that have been adopted to deal with the identified challenges.

Author	Purpose	Method	Results	
			Challenges in creating situational awareness	KM strategies and techniques
(Becerra-Fernandez, Prietula, Madey & Rodriguez, 2007)	To describe the activities of Project Ensayo, that seek to enable and support multiple research projects. This was done by investigating functions, processes, and structures present at emergency operations centres, including KM, situational awareness, DM, and mechanisms of command, control, communication and coordination.	A literature review using mini-case studies was used to understand Project Ensayo	 Failure to clearly define and communicate leadership roles, responsibilities, and lines of authority for disaster in advance of such events, Failure to clarify the procedures for activating the National Response Plan and putting them into application in disasters, Failure to conduct strong planning and robust training 	Important is to first understand the communication and decision processes at the CCC. Develop a methodology/protocol (eg video, audio) that accurately captures how decisions are made at CCC – how to codify the events that happen when managing a crisis. This process mapping should include coding at organisational level taking into consideration: 1) How organisational members interact (who talks to whom) 2) Organisational communication network analysis, including identifying patterns and hubs, and
(Chipman & Wuerfel, 2008)	To interconnect EOCs in real-time to improve their situational awareness and help in coordinating the unified crisis response. To discuss the technology and architecture incorporated in the framework,		A lack of interoperability and interconnectedness makes information sharing and implementing processes that span the different organisations and systems difficult, thus, stifling the unified response agenda.	the use of internet technologies such as XMPP, EDXL, web services, and other advanced information technologies
(Soini, Linna, Leppaniemi & Jaakkola, 2009)	To study methods and techniques to enhance collaboration among disaster responders through improving information availability and distribution using	Regarding the system development, a design science research methodology was used where the data	Technical 1: The problem of communication between disparate data systems since the disaster data required for decision-making is diffuse and located in various venues of different responders. Thus interoperability challenges between	I echnical 1: Service oriented architecture – to support adaptive, creative behaviour and enhance coordination and collaboration throughout the distributed decision- making network.

	Finnish authority organisations.	captured resulted in the implementation of the SSMC/DDKM (Seamless Services and Mobile Connectivity in Distributed Disaster Knowledge Management).	applications as well as interoperability between different networks, devices and terminals Technical 2: typically, there is the use of scenarios written in natural language in situation awareness, making the knowledge in these bound to certain cultures by interpretation and language-dependent. This can result in confusion or uncertainty on the meaning of the terms and concepts used among the various response organisations	Technical 2: Process Modelling- Using graphical descriptions and links between roles and tasks between response organisation and inside the organisation to clarify and enhance cooperation. The process should guide people on what to do, how to coordinate work and should foster effective communication.
(Ahangama & Prasanna, 2017)	To understand how DM stakeholders disseminate knowledge during flood situations and understand the weaknesses and strengths of these establishments	The interpretive case study design and the grounded theory data analysis were used to guide data collection and analysis. Data was collected through direct participant observation.	 Five challenges 1. Procedures-disaster information was not received properly, resulting in a delay in issuing relief funds as in some cases, even urgent situations are obliged to firmly follow established procedures. Failure to search for information from the right constituency also resulted in delays in obtaining the appropriate information for decision-making, because stakeholders limit their functions to specific knowledge sharing assigned to them 2. Knowledge Networks – this refers to the collection of teams, individuals and knowledge repositories and the relationships that exist among them to create, capture, distribute, and apply knowledge. The existence of dense closure networks with tight coordination of knowledge transfer where relationships were only between similar actors resulted in poor response to disaster. 3. Knowledge dependencies – processes strictly depend on the knowledge of another process, this creates conditions for knowledge transfer 	 The use of community knowledge networks 1. Procedure-there should be strict process order for knowledge transfer, procedures, law and order, clear policies, delegated roles for disaster response stakeholders 2. Knowledge Networks – ensure the creation of these formal or informal networks and it should be clear how knowledge is created and transferred in knowledge networks. 3. Remove potential barriers to the free flow of information along the information supply chain in a disaster

			 4. Knowledge Gaps – these occurs when the integration of knowledge from different disciplines and sources is insufficient. This included knowledge contradictions among stakeholders, non-conformities to assigned roles, the unfamiliarity of processes, knowledge repetition and making irrational assumptions, 5. Inability of response stakeholders to improvise – their inability to execute disaster response activities, without pre-planned strategies but using their collective tacit knowledge 	4. Use improvisation to reduce communication challenges and this improvisation is shaped by the flexibility of communities and the response stakeholders.
(Chisita & Fombad, 2020)	To explore how KS can enhance climate adaptation in Zimbabwe. This was done by describing the KS practices for evidence- based climate change adaptation in selected organisations. Also through examining factors that impede KS and ultimately recommending a KS strategy for evidence- based climate change adaptation	A qualitative research methodology using interviews with two participants within each of the three selected organisations involved in climate change actions. Expert sampling, selecting professionals in climate change was done to select participants		KS strategies included the publication of book chapters, papers, conferences, newsletters, websites, meetings, emails, message boards, mentorship, video conferencing, workshops, writing, and communities of practices, communities of interest and communities where people live. Organisations invested in communicative and collaborative tools to support KS. Also, the use of intelligent tools to anticipate user needs, appraise existing knowledge, codifying and store structured explicit knowledge for the actualisation of institutional goals. Climate change agents build on indigenous knowledge of local communities about crisis response caused by natural disasters.

				Through sound policies known to
				lead adaptation.
(Andreassen et al., 2020a)	To explore how different managerial roles influence information sharing between response organisation in a complex rescue operation	A case study approach using a rescue operation in the waters around Svalbard in the high Arctic. Qualitative semi-structured interviews with	A specific set of managerial role patterns assigned within command centres was disturbed due to the complexity of the operational environment. This resulted in emergency coordinators having difficulties in taking on their informational role due to insufficient communication alternatives. Most of the available communication channels were affected by the adverse weather/fallout of communication. This resulted in emergency coordinators relying solely on available	From a managerial role perspective, there is a need for managers to practice authority migration, structure elaboration, role switching and system reset to reorganise the communication structure and, thus, contribute to a more flexible command system
		key personnel were used.	communication channels. This lack of communication capabilities has resulted in KS and situational awareness being less reliable. This problem had a ripple effect on the coordinator's decisional role.	In extreme time-critical cases in which there is no or insufficient information, improvisation, repositioning of resources, adaptation, and reassigning of roles and processes are needed, managerial roles need to be reconfigured to establish communication to gain a certain level of situational awareness and to coordinate the operation on site.
(Oktari et al., 2020)	To explore KM use in all phases of DM phases to confirm the positive role of KM in reducing the impact of a disaster. The focus was to understand the KM practices used in DM, and to understand some implications of KM practices on DM performance.	A systematic literature review to present a comprehensive, exhaustive summary of evidence of KM use in DM using Scopus databases.		KM practices are categorised into four groups: people, process, technology, and goal-oriented KM practices. The KM practices include: providing lessons learned, developing knowledge databases for decision support, active experimentation, knowledge capture through reflective observation, the use of technology, KMS, decision support systems ontology modeling, metamodel- based DM, KS through a CoP
(Sanford, Schwartz & Khan 2020)	To explore ways in which tacit knowledge is	A case on		Develop strong relationships to
1.1.01, 2020/	million taok knowledge 13	Cillano		

employed in	provincial bealth system	connections build trust which is
relationship building and	in Canada was	
decision making		
between both public	public health	
health and acute care.	units and	
	hospital	
	emergency	
	departments	
	(EDs) were	
	used.	
	Purposive	
	sampling was	
	used to select	
	decision-	
	makers in	
	participating	
	organisations.	
	Semi-structured	
	interviews were	
	used.	

Stankosky's KM pillar framework was used to report the KM strategies in Table 3.2 above as explained below:

Leadership: In ensuring effective coordination and collaboration amongst responders, the responders must be able to improvise and execute disaster response activities without preplanned strategies but using their collective tacit knowledge (Ahangama & Prasanna, 2017). This view is supported by Andreassen et al. (2020a) who observed that in extreme time-critical cases in which there is no or insufficient information, responders should improvise and be able to practice repositioning of resources, adaptation and reassigning roles and processes. In exploring how different managerial roles influence information sharing between response organisation in a complex rescue operation, Andreassen et al. (2020a) observed that there is a need for managers to practice authority migration, structure elaboration, role switching and system reset to reorganise the communication structure and, thus, contribute to a more flexible command system.

Technology: To interconnect emergency cooperating centres and, thus, improve their SA and help in coordinating the unified crisis response, the following internet technologies can be used: XMPP, EDXL, Web Services and other advanced IT programs (Chipman & Wuerfel, 2008). The use of technologies was supported by Oktari et al. (2020) who pointed to the development of knowledge databases for decision support, active experimentation, knowledge capture through reflective observation, the use of technology, KMS, DSS, ontology modeling, metamodel based DM as KM strategies for DM. Soini et al. (2009) established that to enhance collaboration and coordination amongst emergency responders, a service-oriented architecture that supports adaptive, creative behaviour should be adopted. Another strategy that can be used to enhance disaster collaboration is investing in communicative and collaborative tools to support KS. Also, the use of intelligent tools to anticipate user needs, appraise existing knowledge and codifying and store structured explicit knowledge for the actualisation of institutional goals (Chisita & Fombad, 2020).

Organisation : To enhance collaboration among disaster responders, the technique of process modeling can be used during which graphical descriptions and links between roles and tasks between response organisations are used to clarify and enhance cooperation (Soini et al., 2009). This process was earlier alluded to by Becerra-Fernandez et al. (2007), who argued that to enhance collaboration, responders should first understand the communication and decision processes at the CCC. This understanding should be attained through process mapping,

understanding how organisational members interact and how the organisational communication networks function. There should be sound policies in place to support collaboration among responders (Chisita & Fombad, 2020). This view concurs with that of Ahangama and Prasanna (2017) who noted that in tapping for community knowledge, there should be a clear procedure, strict process order for KT, clear policies and delegated roles for disaster response stakeholders. According to Ahangama and Prasanna (2017), the formation of formal and informal knowledge networks should be encouraged and it should be clear how knowledge is created and transferred in these networks. To enhance situation awareness, responders should identify and remove potential barriers to the free flow of information along the information supply chain in a disaster (Ahangama & Prasanna, 2017). To encourage and foster a culture of sharing of tacit knowledge, strong relationships should be built because pre-established connections build the trust that is necessary for KS (Sanford, Schwartz & Khan, 2020).

Learning: In understanding how DM stakeholders disseminate knowledge during flood situations, Ahangama and Prasanna (2017) established that responders should make use of community knowledge networks. This finding is supported by Chisita and Fombad (2020) who posit that responders should build on IK of local communities with regards to crisis response caused by natural disasters. Other KM strategies that can be used to support collaboration include conferences, newsletters, websites, meetings, emails, message boards, mentorship, video conferencing, workshops, writing articles and CoP, communities of interest and communities where people live (Chisita & Fombad, 2020). Oktari et al. (2020) suggests lessons learned as well as a CoP as a strategy to improve DM. The agility of an organisation and its ability to swiftly respond to changes in its environment relies heavily on the skills and learning abilities of its knowledge worker. In this complex dynamic business environment, the success of an organisation hinges on its ability to utilise its knowledge coupled with the potential competencies, skills, innovations, thoughts and ideas of its individuals.

3.9 Chapter insights guiding framework development

Each subheading in this chapter contributed to the overall development of the KM framework by providing essential insights, concepts, and strategies that informed its design and implementation. This connection ensured that the framework was well-grounded in existing literature and tailored to address the specific needs and challenges of emergency responders in Zimbabwe.

Subheading	Contribution to KM framework development
The Knowledge-	This section provided insights into the importance of knowledge as a
Based View	critical resource in organisations. By emphasising the role of
	knowledge in enhancing organisational effectiveness, it informed the
	framework to focus on leveraging knowledge for improved coordination
	and collaboration among emergency responders.
KM overview	This subsection outlined the fundamental concepts and principles of
	KM. It established a foundation for the KM framework by defining key
	terms and concepts that guided the subsequent development of
	strategies for effective knowledge sharing and collaboration in crisis
	response.
KM life cycle	The analysis of the KM life cycle explained the stages involved in
	managing knowledge, from creation to sharing and utilisation. This
	understanding allowed the framework to incorporate a structured
	approach to managing knowledge throughout the crisis response
	process, ensuring that information was effectively captured and utilized.
Leveraging ICTs	This section examined the role of ICTs in facilitating the KM cycle. By
to enable KM	highlighting various ICT tools that can enhance communication and
cycle	collaboration, it informed the framework on integrating appropriate
	technologies to support effective knowledge sharing among emergency
	responders.
KM frameworks	This subsection reviewed existing KM frameworks and models relevant
and models	to crisis management. An analysis of these helped in shaping the
	design of the proposed KM framework, ensuring that it incorporated
	best practices and lessons learned from previous models to enhance
	coordination and collaboration.
KM strategies	This section provided specific strategies tailored for crisis response
for crisis	scenarios. It directly informed the framework by identifying actionable
response	KM strategies that DCP could implement to foster effective coordination
	and collaboration among emergency responders in Zimbabwe.
Conceptual	This subsection synthesised the insights gained from the previous
framework	sections into a cohesive conceptual framework. It connected all the

Table 3. 3 : Section contribution to KM framework development

elements discussed in the literature review, providing a comprehensive
roadmap for developing the KM framework aimed at improving crisis
response and collaboration among emergency responders.

3.10 Conceptual framework

The conceptual framework presented in this study (Figure 3.9 below) is a culmination of insights drawn from the literature review conducted in the 2 chapters coupled with the researcher's understanding of the coordination and collaboration challenge at DCP. Each subheading in the 2 chapters contributed to the overall development of the KM framework (section 2.6 and 3.9 respectively). This connection to existing literature not only grounded the framework in established theories and practices but also tailored it to effectively address the unique needs and challenges faced by emergency responders in Zimbabwe. This model outlines the key variables affecting effective disaster coordination and collaboration among responders and their hypothesised relationships. This model served as a guiding framework for investigating the impact of the complex interactions among both the independent and extraneous variables upon the observed outcomes.



Figure 3. 9: Conceptual framework Source: Author

The conceptual framework presented in Figure 3.9 shows that KM can be used to effectively respond to disasters. It indicates a positive correlation between KM and the effectiveness of crisis response. Technology should act as the backbone to crisis response and an enabler to KM that is used across all the KM process cycles. This conceptual framework shows that for DCP to use KM for coordinating challenges, KM should be based on an IT infrastructure that allows for the collection of disaster information that enhances all parties' SA. The infrastructure should provide for the storage of data and the use of technologies capable of mining information from the database. The mined information should be made available to the responders to allow them to make prompt decisions. Thus, there is a need for IT tools that capture, store, search and retrieve data, send the relevant information to the various responders in a format appropriate to the

responder, share information, foster collaboration amongst the various responders and solve problems and provide recommendations to the responders for prompt decision making.

The conceptual framework (Figure 3.9 above) also shows that even though technology is at the core, DCP should focus on the following:

Leadership: DCP leadership should identify the disaster coordination goals, the disaster response actors, and create a group of disaster response leaders comprising representatives from NGOs or cluster leaders who will be involved in group decisions, such as goal decomposition, i.e., who does what, to whom and where. This group should agree on the KM and communication strategies. Leadership should cultivate a culture of disaster information sharing so that responders have a common perception of the disaster situation.

Organisation: Several organisational changes should be effected and managed. DCP's organisational structure, operational processes, staff, skills and systems should change to support the various disaster responders in accessing the needed information timeously in the correct format. This process should include setting up structures to manage actor interdependence, upgrading personnel skills to manage disaster information and knowledge, and adding a KM champion on the organogram to drive the disaster's KM initiative. Some group decisions should be made such as deciding and agreeing on the governance mechanism, reporting structure, and frequency of meetings and complaints mechanisms.

Learning: For effective use of the technologies and implementation of the agreed KM strategy, DCP should create a conducive environment for learning. OL, using approaches such as increasing internal and external communication, creating a learning community, promoting cross-functional teams, building institutional memory based on lessons learnt, arranging group discussions for experience sharing and training, should be adopted. The group should agree on the learning approach.

Culture: The DCP's leadership should nurture a culture that actively promotes and supports proficient KM within the realm of interagency collaboration. The focal point should be on emphasising essential elements such as shared information, collaborative undertakings and communal learning among a diverse array of agencies and organisations. This strategy contributes significantly to enhancing the processes of problem-solving, coordination and

decision-making within the framework of these multifaceted entities working harmoniously together. At the core of this cultural approach lies the establishment of a mutual understanding, a shared vision and common objectives among all participating entities. This collective comprehension forms the cornerstone for aligning collective endeavours, ensuring that all participants are unified in their pursuit of overarching shared objectives. Moreover, fostering an environment of open and transparent communication is imperative, facilitating the seamless exchange of challenges, insights and up-to-the-minute updates among the involved agencies. The bedrock of this culture should be rooted in mutual trust and respect, creating an atmosphere in which agencies are empowered to share their specialised knowledge and expertise without concerns about critique or competition. In light of this, the DCP should formulate explicit norms and guidelines for disseminating information, thus, assuring that pertinent knowledge is accessible to all engaged stakeholders. The promotion of the flourishing of interagency teams is a cornerstone of this culture, enabling these collaborative units to engage in specialised projects that leverage the diverse skill-sets and perspectives of their members. An orientation towards continuous learning should pervade the culture, allowing agencies to glean insights from one another and thereby avoid the need to reinvent established solutions. Advocating resource sharing, encompassing both expertise and capabilities should also be championed as a pivotal facet of this culture. There should be established and structured processes for capturing, organising and disseminating knowledge that underscores the paramount importance of efficient KM. Additionally, unwavering leadership commitment and engagement should be ensured, given leaders' vital role in establishing the cultural tone and exemplifying the values associated with collaboration. Acknowledging that conflicts and divergent viewpoints are inevitable, it is essential to establish mechanisms for constructive conflict resolution. The culture should facilitate swift and transparent issue resolution to pre-empt any hindrances to collaborative efforts. Incentives should be introduced to motivate participants through recognition and the opportunity to contribute to collective accomplishments. This practice enables agencies to identify areas requiring enhancement and adaptation. Ultimately, the DCP's endeavours should culminate in cultivating a culture that sustains effective interagency collaboration, thus, optimising its potential for success.

Measurement: The role of measurement is pivotal in the realm of interagency KM because it serves as a tool to oversee, evaluate and enhance the efficiency of knowledge dissemination, teamwork and learning within a wide spectrum of agencies. The set of metrics encompasses elements such as speed of response, accessibility of knowledge, utilisation of knowledge, precision and comprehensiveness of information, cooperation and communication, assimilation

and adaptation of insights, readiness and training of employees, sharing and contributing knowledge, satisfaction and feedback, optimisation of resources and the ongoing enhancement of processes.

This relationship between KM and Crisis Response, however, be affected by several extraneous variables as shown in Figure 3.9 above.

3.11 Chapter summary

This chapter has underscored the profound importance of effective communication and strategic KM disaster response. It delved into a range of perspectives for implementing KM, encompassing people-centred, technology-centred, process-centred and goal-oriented approaches. The integration of KM in successful disaster response entails the art of tailoring strategies from these viewpoints to suit specific contextual requirements. Numerous KM models were introduced. This chapter stressed the paramount significance of a meticulously designed KM strategy that aligns seamlessly with the organisational objectives. The chapter also highlighted the pivotal role of IT during crisis response. Lastly, a conceptual framework was displayed and discussed in Figure 3.9.

CHAPTER FOUR

THEORETICAL UNDERPINNINGS

4.1 Introduction

This chapter aims to describe the various theories that underpin this study. Owing to the interdisciplinary nature of this research, its theoretical foundation was based on theories from various disciplines. The aim was to produce a unified framework that incorporates crisis management, IT and KM to aid in effective coordination and collaboration by the DCP. Theories related to the various networks of emergency responders, their social structures and network practices were discussed. This provided a vibrant understanding on how information is shared and managed in crisis response to facilitate coordination and, hence, emergency and crisis response. Corley & Gioiia (2011) defines a theory as a statement of concepts and their interrelationships that highlight various phenomenon and why they occur. Gregor (2006) defines theory as a process that serves the following purposes: it analyses and describes the phenomenon under study; gives a detailed explanation of why and how things happen; predicts what will happen and provides a prescription. The following theories guided the development of the data collection tool and data analysis in this study: the Actor Network theory (ANT), the Structuration theory and the 7S McKinsey model. Figure 4.1 below provides the roadmap for this chapter.



Figure 4. 1: Chapter outline.

Source: Author

4.2 Actor Network Theory

Bruno Latour, Michel Callon and John Law developed the Actor Network theory (ANT) in the 1980s (Latour, 2005). Unlike other theories, ANT considers not only individual people but organisations and objects. It is a systematic framework for examining the set-up that surrounds technological achievements. ANT does not emphasise why a network exists but rather focuses on the infrastructure of actor networks, how they are formed and how they fail to function (Bencherki, 2017). The primary tenet of ANT is the concept of heterogeneity, i.e., the fact that the network comprises different entities. The notion behind ANT is that no one acts alone (Latour, 2005). A network encompasses social and technical entities, thus, introducing the socio-technical aspect of KM systems. ANT argues that systems are affected by various factors, hence, it is important to consider the 'big picture' to determine these factors. Actors can be humans or nonhumans that should be integrated into a conceptual framework, assigned an equal amount of agency and treated as inseparable by ANT. From this perspective, a concrete mechanism that holds the network together can be described. Systems, thus, should be effectively approached if all the parts (technological, natural or human) are viewed as active and interacting members of the system (Latour, 2005). ANT states that a network refers to an interconnected group of elements that affect each other and achieve shared goals. Such a network is composed of actants, i.e., the parts of the network that have a role to play. The network comprises interacting connections. Actants are measured and valued in terms of how they interact in the system. Mediators are those actants that cause changes to the system while intermediaries are actants that do not change the system.

The ANT provides a unique perspective on the understanding of complex social interactions and networks in crises. ANT recognises the role of human and non-human actors (equipment, technology and infrastructure) in crisis response. An understanding of these non-human actors helps in comprehending how technology interacts with humans to facilitate effective response operations. By focusing on a network of dynamic relationships, ANT can provide valuable insights into resources and information flows within the network of multi-agencies. ANT also allows for the exploration of how new actors and elements emerge during crisis responses and can help identify power imbalances and potential areas of conflict among the response organisations.

Actor-Network Theory (ANT) has been applied across various scenarios to enhance understanding of social interactions and systems. For instance, Yao and Liu, (2022) utilized ANT

to analyse resilience within social-ecological systems, highlighting the complex relationships between humans and nature and facilitating a reconceptualisation of resilience components. Similarly, Mustapha,(2024) employed ANT to identify barriers and determinants of knowledge sharing, emphasising the need for a cohesive structure in knowledge sharing tools to improve implementation. In the context of natural hazard mitigation in Zimbabwe, Katanha and Simatele, (2019) used ANT to explore daily life complexities during natural disasters, treating both human and non-human entities as equal actors, which provided insights for developing eco-based mitigation strategies. Lastly, Ghulam et al., (2023) applied ANT to analyse Pakistan's COVID-19 risk management strategies, focusing on the interactions among various actors, especially the government and non-human elements like medical supplies, to illuminate the sociotechnical dynamics that influence effective responses. Collectively, these studies demonstrate ANT's versatility in revealing the intricate networks that shape governance, resilience, and risk management across different contexts.

However, ANT can be difficult to apply directly in high-stress response situations owing to its complexity. ANT's descriptive nature and practical application in crisis management can be limited because it fails to provide insight into prescriptive guidelines for action. Another ANT weakness is that it overlooks hierarchies and may not fully capture the importance of leadership and clear decision-making in crisis response. ANT ignores human judgement in decision-making, thus, failing to fully account for the psychological and emotional aspects of crisis response. In some instances, ANT's application in crises might raise ethical concerns, especially when it involves examining sensitive data or interactions among vulnerable populations.

In summary, ANT can be a valuable framework for providing insights into crisis dynamics especially when combined with other theoretical and practical models that counteract its weaknesses and, thus, enhance its utility in crisis response contexts. For example, unlike the ANT which ignores human judgement, the structuration theory acknowledges the role of human judgement and how emotional and psychological aspects affect action within social systems in crisis response.

4.3 Structuration Theory

The Structuration theory was developed by Anthony Giddens (1984) and is defined as how humans' actions both shape society and are shaped by society through societal practices. Human

actors (agents) are knowledgeable and have the capability of exploiting resources and regulating other people within the collaborative context (Jones & Karsten, 2008b). Human actors' interaction is based on their current knowledge of the world, social rules of conduct and their capabilities. The actors' interactions are a result of their meaning, intentions, power and penalties that result in changes in the structure governing their activities. These agents are self-governing and there is an unceasing flow of reflexively monitored activities that can be inhibited by their reliance on a social collective. To constitute a social system, actors draw upon structures, resources and rules (Jones & Karsten, 2008a). The Structuration theory argues that social life is a product of practices that people undertake and the active flow of such practices and ongoing activities. In relation to the Structuration theory, Giddens (1984) argues for the notion of duality of structures that he explains as the structural properties and resources entrenched in action and involved in the production and duplication of social systems(Giddens, 1984) (Giddens, 1984). The dimensions of the Structuration theory include the exercise of power (domination), communication (signification) and social behaviour and norms (legitimation).

This chapter aims to describe the various theories underpinning this study, which examined the current coordination and collaboration practices in crisis response practiced in Zimbabwe while also identifying barriers to effective coordination and collaboration among emergency responders. . In order to understand the interplay amongst these stakeholders and social structures, the Structuration theoretical lens was adopted. The application of this theory helped to explain the influence of Zimbabwe's cultural and social values on the structure and socio-culture power of the emergency responders' collaboration and how their actions produce and reproduce social structures in different contexts (Thi Pham, 2019). This theory was also used to analyse the coordination mechanisms employed during crisis response. These social practices comprise the established communication patterns, behaviour patterns and coordination processes that occur within the DCP. These practices are aimed at ensuring effective teamwork (collaborative decision making, communication and information exchange) among the emergency responders. These practices are important for optimising resource utilisation and maintaining situational awareness. The Structuration theory was employed to analyse both formal and informal social structures (such as organisational arrangements and hierarchies, the roles that define how the different individuals and groups work together and coordinate their efforts during disaster response to establish a clear chain of command and how it impacts the context of the study). The Structuration theory was used to analyse the organisational culture to reveal how this phenomenon influences

the collective climate during crisis response because emotional and psychological aspects are embedded in culture.

However, while the Structuration theory offers valuable insights into the interplay between agency and structure, it presents some weaknesses when applied within the crisis response context. These flaws occur because crisis response entails highly volatile and time sensitive situations and the application of Structuration theory may have limitations in addressing such complexities, e.g. accounting for the emergence of new patterns. Structuration focuses on agency and organisation and may fail to address the resource shortage in crisis response.

4.4 The 7S McKinsey Model

The 7S McKinsey model is a management paradigm developed by consultants McKinsey & Company in the late 1970s (McKinsey and Company, n.d.). It provides a comprehensive approach to assessing and enhancing organisational effectiveness by examining seven interconnected elements. These elements are strategy, structure, systems, skills, staff, style and shared values as shown in Figure 4.2 below. The model emphasises the importance of aligning these elements to achieve organisational success. Managers and leaders often use the 7S McKinsey model as a diagnostic tool to identify strengths, weaknesses and areas for improvement within their organisations. It helps organisations assess their current state, identify potential issues and develop strategies for better overall performance.





Source: McKinsey and Company

4.4.1 Weaknesses of 7S McKinsey model

The 7S McKinsey model, while offering valuable insights into organisational effectiveness, has certain limitations when applied to crisis response situations. Crisis response is characterised by its unique challenges and time-sensitive nature, and the 7S McKinsey model may not fully address the complexities and demands of crisis management. For example, this model focuses on comprehensive assessment and alignment of elements while crisis response focuses on urgency, unpredictability and time constraints. As a result, the 7S McKinsey model might not fully capture the emergency of new challenges in crisis response. The model's rigid approach might not provide the required real time adaptation and flexibility to changing crisis situations. Crisis response involves multiple stakeholders while the 7S McKinsey model primarily focuses on an organisation's internal crisis. Thus, this practice fails to fully address the external factors and stakeholders involved in crisis response such as NGOs, government agencies, volunteers and

the general public. Crisis response is usually characterised by resource limitations as well as the need for effective communication and the 7S McKinsey model might not fully address the resource limitation challenges as well as provide guidance on how to optimise communication in crisis response. Despite these limitations crisis response organisations can benefit from knowledge of the 7S McKinsey model. Crisis response organisations need to incorporate the perspectives of external stakeholders as well as crisis specific strategies.

4.5 Justification for the choice of the theories

Due to the complex and transdisciplinary nature of DM and response, multiple theories were essential to effectively address the coordination challenges in Zimbabwe. No single theory could comprehensively inform the development of a KM framework for improving emergency and crisis response. Thus the development of the KM framework for improving emergency and crisis response in Zimbabwe was significantly informed by three key theories: ANT, Structuration Theory, and the 7S Model. Each of these theories provided unique insights that shaped the framework's design and functionality.

Actor-Network Theory (ANT)

ANT emphasized the importance of understanding the relationships and interactions among various stakeholders involved in disaster response. By mapping out the roles of human actors (such as government agencies, NGOs, and community leaders) and non-human actors (like technologies and communication tools), the framework was able to identify existing barriers to effective coordination and collaboration. Interviews guided by ANT revealed how power dynamics and communication flows impacted knowledge sharing among emergency responders. This understanding informed the design of strategies to enhance collaboration and ensure that all actors were engaged in a cohesive response effort.

Structuration Theory

Structuration Theory highlighted the dynamic nature of organizational structures, illustrating how they are continuously shaped by social practices. This theory facilitated the identification of critical elements within the crisis response landscape, including existing policies, communication channels, and cultural norms. By analysing both formal and informal rules that govern knowledge sharing, the framework was able to recognize the influence of individual agency—the roles and actions of responders during crises. This understanding was crucial in ensuring that the

framework was adaptable and responsive to the evolving needs of the emergency response environment, thereby enhancing overall knowledge sharing and collaboration.

7S Model

The 7S Model provided a structured approach to examine the existing coordination strategies within the emergency response framework. By analysing elements such as organizational structure, systems, shared values, skills, style, and staff, the framework was able to identify potential barriers to effective coordination. This comprehensive analysis allowed for the development of specific KM strategies that addressed these barriers, ensuring that the framework could facilitate better communication and collaboration among emergency responders.

4.6 Chapter summary

This chapter provided the background to the following theories: Actor Network theory (ANT), Structuration theory and 7S McKinsey model. All three notions were used in this research study as methodological and analytical tools for crafting the data collection tool and analysing data. To gain a more comprehensive understanding of the complex social processes of crisis coordination and collaboration, ANT was combined with the Structuration theory to explore the patterns of social connections among the response organisations, the role of institutions and individuals as nodes in the network and the flow of information, resources and power between them and how they reinforce and reflect social structures.

CHAPTER FIVE

RESEARCH PHILOSOPHY AND METHODOLOGY

5.1 Introduction

To empirically validate the robustness of the conceptual framework presented in the previous chapter, Chapter 5 presents the methodology used for data collection and analysis and justifies all the decisions made. The first section presents the ontological and epistemological positions that the researcher implicitly committed to. These positions lead to the research approaches that the researcher then chose. Figure 5.1 below shows the chapter roadmap to guide the reader.



Figure 5. 1: Chapter outline



5.2 Research philosophy

Research philosophy refers to the set of assumptions, beliefs and worldviews that guide a researcher's approach to knowledge generation. It shapes the researcher's perspective regarding what is knowable, how knowledge can be acquired and what information counts as valuable or meaningful knowledge (Al-Ababneh, 2020). There are three types of research

assumptions a researcher can make and which distinguish research philosophies: ontology, epistemology and axiology (Rosida, Amaliah, Mahardika & Suratno, 2023).

5.2.1 Ontology

Ontology refers to the assumptions that researchers make concerning the nature of existing reality (Al-Ababneh, 2020). Scotland (2012) defines ontology as a science that focuses on describing the kind of world one wishes to investigate in terms of the structure of reality. Ontology can be summarised as concerning the researcher's beliefs about the nature and characteristics of reality exhibited within the social world. At the start of a research project, researchers need to take a position regarding their ontological assumptions or perceptions of how certain phenomenon operate and their current status. This practice is necessary because the ontological assumptions and arguments inform the type of data collection methods and tools and the data analysis and data interpretation tactics to be adopted by the researcher.

This research study aimed to develop a KM framework that improves coordination and collaboration among emergency responders. The researcher adopted a critical realist ontology for this process. In the critical realist ontology, reality is viewed as complex and multi-layered and existing beyond the basic concepts that people experience and observe (Bogna et al., 2020). As a critical realist, the researcher believes that the reality of the DCP's disaster coordination challenge consists of more than just what can be witnessed and/or experienced within the empirical domain. It acknowledges the complexity of the phenomenon and the need to account for multiple layers of reality, rather than simply focusing on observable outcomes. The three layers of reality from a critical realist perspective include the empirical layer, the actual layer and the real layer.

While conducting this study, the researcher assumed that the reality of emergency and crisis response and KM exist independently of the researcher's observation and perceptions. The reality is stratified, consisting of the empirical, actual and real domains. As part of the research process, the researcher sought to observe the current coordination mechanisms and collaboration practices employed by the DCP during emergency and crisis response (empirical domain). However, the researcher also sought to understand the less observable aspects or factors, such as the institutional policies, communication channels and decision-making processes that influence the stakeholders' behaviours (real domain). In addition, the researcher also explored

the sociocultural and political factors that have an impact on disaster coordination in Zimbabwe (real domain).

Thus, the critical realist ontology was the most appropriate methodology to adopt for this study because it allowed for a deeper understanding of the contingent conditions and causal powers that influence the success of the KM framework in improving emergency and crisis response. The critical realist ontology sought to uncover the deeper mechanisms, structures and contextual factors that shape and hinder effective emergency and crisis response in Zimbabwe. The critical realism ontology acknowledges the complexity of emergency and crisis response, and, instead of simply focusing on observable outcomes, the researcher sought to uncover the deeper and less visible factors that contribute to the success or failure of the KM framework for improving disaster response.

5.2.2 Epistemology

Epistemology focuses on the expectations one makes regarding the origin of knowledge, its form and nature, how one acquires it and how one communicates it to other human beings (Scotland, 2012). Epistemology focuses on answering questions regarding the relationship between the known and the knower, how reality can be known, the assumptions that guide the knowing process and how findings are achieved. According to Al-Ababneh (2020) epistemology focuses on explaining and understanding how people become aware of what they already know. It is concerned with providing a philosophical basis for determining the kinds of knowledge that are probable and how their legitimacy and adequacy can be validated. Epistemology addresses issues relating to do with where and how knowledge can be discovered and the methodology used to acquire such knowledge (Rosida et al., 2023). Epistemology also focuses on describing the relationship between the researcher and the researched (Kivunja & Kuyini, 2017). The major forms of epistemology include constructionism, objectivism and subjectivism, each of which offers differing perspectives on the nature of knowledge (Al-Ababneh, 2020). The researcher adopted a critical realist epistemology that occupies the middle ground between the subjectivist and the objectivist ends of the epistemological spectrum.

According to critical realism, the researcher has no immediate influence on reality and, as such, places little emphasis on epistemology. The researcher employed a retroductive approach that

enables the researcher to move back and forth between the empirical observation and the theoretical explanations to uncover deeper concepts, such as political and sociocultural factors that affect the way disaster knowledge is acquired, stored, shared and utilised. The researcher also acknowledged the limitation in personal knowledge claims and revisited the conceptual model as new evidence emerged that was discussed in the previously reviewed literature. The knowledge was generated from a diverse set of stakeholders, including the DM academics, KM experts, DROs, CPC members, the DDC and the community. This process enabled the researcher to develop a nuanced KM framework aimed at improving emergency and crisis response in Zimbabwe

5.2.3 Axiology

Axiology refers to the role of values and ethics in the research process that guide the reasons for all human actions. Axiological assumptions refer to the underlying principles, beliefs and criteria that the researchers use to determine what is valuable and worthwhile in their research (Rosida et al., 2023). In this research, study, the researcher held the value that the proposed KM framework should contribute to improving emergency and crisis response in Zimbabwe. The researcher was driven by the belief that the research results should make a real-world practical contribution to improving the living conditions of Zimbabweans during and after disasters.

5.3 Research paradigm

A research paradigm refers to key epistemological and theoretical assumptions regarding the appropriate way to conduct research (Bonache & Festing, 2020). The critical realism paradigm was adopted for this study. It assumes the existence of an objective reality that is shaped by social and cultural factors. It places importance on the identification of causal mechanisms and generative structures that underlie observable phenomena.

5.4 Methodology

Methodology relates to the action plan, approach, design or process that lies behind the choice and use of particular methods (Al-Ababneh, 2020). The purpose of methodology is to evaluate, describe and justify the use of particular methods. There are various methodologies that underpin a research project, these include case studies, ethnography, experiments, surveys and action research (Saunders, Lewis & Thornhill, 2009). This research study adopted a case study approach. The DCP comprised the situation for this case study. A case study approach was the most applicable in this study because it helped the researcher acquire an in-depth understanding of participants' perceptions and opinions regarding how they carry out their coordinating role and how best this method can be improved through the adoption of the proposed KM framework (Hollweck, 2016).

5.4.1 Case study setting – The Department of Civil Protection

The research setting for this study is the Department of Civil Protection (DCP) which is the department responsible for civil protection issues in Zimbabwe. Of particular interest in this study is how the department manages natural disasters such as cyclones and floods. The DCP is situated in a country characterized by a diverse geography, ranging from urban centers to rural areas, each presenting unique challenges in disaster preparedness and response. This department is tasked with coordinating efforts among various stakeholders, including government ministries, non-governmental organisations, and local communities, to enhance national resilience against disasters. This department is tasked with implementing policies, managing resources, and facilitating collaboration among various stakeholders during emergencies. The socio-economic context of Zimbabwe, marked by both opportunities and challenges, further influences the DCP's operations. Recent experiences with significant events, such as Cyclone Idai, have underscored the need for effective coordination and collaboration among agencies. The study takes place during a period of increasing awareness of disaster risk management, highlighting the urgency for structured approaches that leverage the DCP's existing frameworks and resources. This setting is particularly relevant to understanding how the DCP can enhance its collaborative efforts and improve overall disaster response strategies in Zimbabwe.

5.4.2 Research Design

Research design is defined as a plan that indicates how data will be collected, measured and analysed (Saunders et al., 2012). The research design determines the type of data required and how it should be collected. The study utilised a qualitative case study approach as outlined by Harrison, Birks, Franklin and Mills (2017), which is suitable for exploring complex phenomena

within their real-life context. This approach allowed for an in-depth understanding of the DCP's operations and its interactions with stakeholders. The Design Science Research (DSR) was the most applicable research design in this study because it is a practical method that produces a technology based solution. DSR plays two major roles: "to contribute to knowledge by generating knowledge, insights and coming up with new theoretical explanations" and "to utilise the knowledge gained to create change, improve existing solutions and, in the process, solve the problem at hand" (Baskerville, Baiyere, Gregor, Hevner & Rossi, 2018). DSR focuses on solutionoriented knowledge that is practical and uses results to design solutions and develop new knowledge in the process (Gengler, Rossi, Hui & Bragge, 2006). Its ultimate goal is to construct a new reality for solving existing problems instead of concentrating on the known reality. Thus, this approach was the most appropriate for this study that sought to develop a framework for improving collaboration and coordination between disparate emergence responders. This approach is in line with Baskerville et al. (2018) who state that one of the mandates of DSR is to produce practical solutions to 'teething problems' by instigating change through the improvement of existing systems. DSR is used to create unique and innovative elucidations that are pertinent to the issues and contexts under study, aiding in the design of solution-oriented frameworks. In addition, Table 5.1 below shows the DSR characteristics that made it the most applicable research design for this study:

Characteristic	Application to this study
DSR's goal is to understand the	The study sought to develop an understanding of the
problem domain (Hevner & Chatterje,	knowledge concerning coordination and collaboration in
2004), develop knowledge that can	emergency response with the overall goal of designing a
be used to design solutions to	framework that would improve coordination and
problems.	collaboration, hence, improving emergence response in
	Zimbabwe.
DSR process is a sequence of expert	This study sought to develop a KM framework that
activities that creates a purposeful,	addresses the coordination and collaboration challenges
innovative artefact for a special	at DCP.
problem domain.	

Table 5. 1 : Applicability of the DSR to this study

Evaluation is undertaken to ensure its	Both humanitarian-oriented and technology oriented
quality, efficacy and utility for the	experts participated in the evaluation process.
specified problem.	

There is consensus among researchers (Gengler et al., 2006; Peffers, Tuunanen, Rothenberger & Chatterjee, 2007) that DSR includes the following six steps: 1. Problem identification; 2. Defining the research objectives; 3. Designing and developing the artefacts; 4. Demonstrating; 5. Evaluating the solution by matching the objectives and the observed results from the use of the artefacts, and 6. Communicating the problem, the artefact, its usefulness and effectiveness to other practitioners and researchers. According to Baskerville et al. (2018), the outcome of a DSR project is always an artefact that serves a particular purpose, such as a process, product, technology, methodology, procedure, technique or a combination of these. Figure 5.2 shows the DSR process map (Peffers et al, 2007). In this study, the entry point was a problem initiated. Figure 5.2 presents DSR as a strategy or plan for collecting, measuring and analysing data:



Figure 5. 2: Design science research methodology: Process map

Table 5. 2 : Application of Peffers et al., (2007)'s six activities in this study.

DSRM STAGE AND RQ	DESCRIPTION OF WHAT WAS DONE IN THIS STUDY (ACTIVITY)	(KNOWLEDGE BASE)
Identify problem and motive	The researcher defined the problem and justified the value of a solution	Aim was to understand the problem's relevance, the
(PO1)	"There is a lock of accordinated information and knowledge in natural disasters and	Aim was to understand the problem's relevance, the
	mere is a lack of coordinated information and knowledge in natural disasters and	
		Knowledge base: Literature review, ANT, structuration
	the various organisations that respond to emergencies, leading to slow decision-making	Methodological tools: PAR interviews with KI to
	processes and long response times. This situation negatively affects the affected	understand the <i>status quo</i> in coordination and
	communities, exacerbating poverty in the region."	collaboration in disaster response.
Define objectives of the	Researcher described the specific criteria that the proposed solution for the problem	The researcher searched for knowledge of what is
solution (RQ1)	should meet.	feasible and what can assist in defining the objective
	Design a knowledge-based solution (based on a technology infrastructure) that should	through:
	ensure timeous sharing and visualisation of only the information that is relevant to the	Knowledge base: Literature review
	emergency responder's role or function, hence supporting decision-making.	Methodological tools: PAR interviews
Design and development of	Researcher developed an artefact that solved the problem.	Application of methods, technologies and theories to
the artefact		create an artefact that solves the problem through:
	A KM Framework was developed	Knowledge, Methodological tool: ANT, structuration,
		7S McKinsey model, empirical studies
Demonstration	Demonstrate the use of the artefact	The researcher explained how the framework works to
		solve the problem through:
	The researcher presented the framework to stakeholders.	Methodological tools: PAR interviews with disaster
		response expert
Evaluation	The researcher checked how well the artefact supports the problem of emergency and	Knowledge of relevant metrics and evaluation
	crisis coordination and collaboration.	techniques.
	The experts evaluated the artefact.	Methodological tool: PAR interviews with disaster
		response experts
Communication	The researcher communicated the problem, its designed solution, the effectiveness,	This was conducted through publications
	and novelty of the designed solution to DCP, NGOs, researchers and other relevant	
	audience.	

5.5 Methods and source

This study used participatory action research (PAR) within the DSRM to collect data from the NGO respondents, as well as from the Ministry responsible for coordinating crisis response in Zimbabwe, i.e., the DCP.

5.5.1 Participatory action research (PAR)

A participatory approach was employed by actively involving stakeholders throughout the data collection process. Key participants, including experts, disaster response organisations, case organisation and community representatives, were engaged through structured interviews that encouraged open dialogue and collaboration. These interviews allowed participants to share their experiences, challenges, and insights regarding current coordination and collaboration practices in disaster management. This researcher adopted the PAR method for collecting data based on her expertise in academic knowledge and the fact that the study participants are experts in humanitarian work and possess vast knowledge and practical experience regarding coordination and collaboration in crisis response. This collaborative data collection process not only enriched the findings but also fostered a sense of ownership among stakeholders, ultimately leading to more relevant and effective recommendations for enhancing disaster response efforts. By combining academic and practical knowledge, the researcher believed that a sustainable and relevant plan could be designed. Thus, the researcher and respondents co-created a feasible intervention



Figure 5. 3: PAR - Adopted from Chevalier and Buckles (2013)

5.5.2 Population, sample and sampling technique

• Population

The population for the study was thoughtfully selected to encompass a diverse range of stakeholders involved in civil protection in Zimbabwe. Members of the DCP constituted the primary population, as they are directly responsible for managing civil protection issues and possess firsthand knowledge of existing coordination mechanisms and collaboration practices. Additionally, representatives from various line ministries and organizations that support the civil protection structure, such as the Civil Protection Committee (CPC) (Appendix 9), were included due to their expertise and involvement in disaster response efforts. Communities, are the ones affected and respond first during disasters, were also integral to the population, as their experiences and insights are crucial for understanding the effectiveness of DCP's coordination. Furthermore, experts in civil protection, including disaster academics and IT specialists, contributed valuable knowledge regarding potential improvements in coordination practices. Together, these diverse categories of participants provided a comprehensive foundation for the study, ensuring that the resulting KM framework would be informed by a wide array of perspectives and expertise relevant to enhancing disaster response. As shown in Appendix 9, Civil Protection encompasses a number of stakeholder. Due to the dynamic nature of the civil protection, the exact population for this study cannot be precisely determined, as membership frequently changes with individuals joining or leaving the committees. Consequently, this study acknowledges that the population is fluid, which may impact the generalizability of findings

• Sampling technique

A multi-stage sampling strategy was adopted in this study in which the researcher combined purposive and convenience sampling. The researcher initially identified the categories of responders who would answer the research questions. These potential participants were identified as the case organisation (represented by the DCP, CPC members, DDC and SPAD), Experts (comprising DM academics, KM experts and IT experts), DROs (comprised of NGOs) and community members. The following criteria were used to select participants in each of the categories:

Case	For DCP – the leaders of the DCP
organisation	For CPC members – members of the DDC and SPAD who play a
	significant role in hydrological-related hazards

Table 5.3 : Selection	criteria
-----------------------	----------

Experts	The researcher used the internet to identify academics who have published						
	articles/studies relating to disaster coordination and information sharing						
Disaster	This research study was motivated by cyclone IDAI, as such, NGOs that						
Response	had participated in responding to cyclone IDAI were selected						
Organisations							
Community	This research was motivated by cyclone IDAI and, as such a community,						
	residing in Manicaland (the province most adversely affected by the						
	cyclone) was selected						

The researcher first purposively identified and selected participants based on the above criteria. The main reason for purposively picking these organisations was to understand the coordination mechanisms and collaboration practices used by the DCP and the challenges they have faced working with the coordinating organ (DCP), what actions they think could be implemented to address these collaboration challenges and to use these in the development of the KM framework. In the second stage, the researcher sent requests for participation letters to the purposively selected individuals or organisations. Follow-ups were made but only those parties who responded and agreed to participate were included in the final sample (convenience sampling). Data was collected until saturation was achieved.

• Sample size

A total of 26 interviews were conducted. Six interviews were conducted with the case organisation with the following respondents (DCP 1 interview, CPC 3 interviews, and DDC 2 interviews). Twelve interviews were conducted with DROs all made up of NGOs. However, one of the interview was a focus group comprising of six members who are all Directors of different NGOs. In addition, seven interviews were conducted with experts comprising of 2 interviews with DM academics, two interviews with KM experts, three interviews with IT experts. Lastly, a focus group was done with a community made up of eight members. Data collection was conducted until saturation was reached, which is defined as the point at which no new themes or insights emerged from the interviews.

5.5.3 Data collection methods and techniques

PAR was used within the DSRM to attain an understanding of the DCP's operating strategies and how it coordinates emergency and crisis response in Zimbabwe. This iterative process involved conducting multiple interviews with participants until it became apparent that additional data would yield little to no new information. By systematically analyzing the responses as they were collected, the research ensured a comprehensive understanding of the subject matter, ultimately reinforcing the validity and richness of the findings.

• Data collection process

The primary method of data collection for this study was through interviews. Initially, the researcher sought and obtained consent from the relevant organizations of the respondents. For members of the case organization, specifically those from the DCP and the CPC, the organisations identified the most suitable respondents who could provide valuable insights. In the context of DROs, the selected participants were predominantly senior-level staff from NGOs who had engaged extensively during Cyclone Idai. This particular cyclone was chosen as the focus of the study due to its status as one of the most devastating disasters to impact the nation, second only to the COVID-19 pandemic. For the community perspective, a locality in the Manicaland province was selected, since Manicaland was significantly affected by Cyclone Idai. Additionally, experts in various fields, including IT, KM, and DM academia, were also invited to contribute their insights. In-person interviews were conducted at the respondents' workplaces. Only three interviews were held online via the Zoom platform, as the respondents were eager to participate but had limited availability. On average, each interview lasted approximately one hour. At the commencement of each interview, the researcher provided a clear explanation of the study's objectives and assured participants that they could withdraw from the interview at any point if they wished. Furthermore, participants were informed that the interviews would be recorded to facilitate accurate transcription.

• A summary of categories of data

Category	Data Type	Data	Data collection	Description of use			
		Source	method				
Primary	Qualitative	DCP	Interviews and 2	Gained insights on the			
data		DRO	focus groups (1with	current coordination			

Table 5.4 : Categories of data

		Experts	community and		and	mechanisms		and		
		Communitty	another	one	with	collaboration		pra	practices,	
			DROs)			barriers	to	eff	ective	
						coordination		and		
						collaboration and key K		y KM		
						strategies for improvi		roving		
						disaster coordination.				
Secondary	Qualitative	Civil	Literature	surv	еу	Insights	into	the	legal	
data		Protection				framework governing DM				
		Act								

5.5.4 Data analysis

Data collected from the four categories of respondents were analysed using a systematic and rigorous approach that consisted of the following procedures:

- 1. Data transcription: After data collection, the researcher made copies of the audio files as a backup to prevent any data loss. Transcription was completed manually during which the researcher listened to the audio recording and transcribed the spoken content verbatim. Each text file was labelled. To ensure accuracy and completeness of the transcripts, the researcher listened to the audio files three times, checked the transcripts for spelling and typing errors and made the necessary edits. Folders for the four groups of respondents were created and the files labelled and saved under a relevant folder name and number, for example for Disaster Response Organisations, the folder name was DRO and the files within the folder were named DRO_1 to DRO_12. All the folders were password-protected to ensure the confidentiality and privacy of the study participants.
- 2. Data aggregation and cleaning: The transcripts in each folder were first organised into a single data set. Responses for each question were compiled in one position in one document. Any personally identifiable information was removed to protect the confidentiality of participants. The researcher read the transcripts multiple times to gain a thorough understanding of the content and to identify emerging themes or patterns. During this stage, initial codes were noted.
- Coding and code generation: ATLAS.ti.24 was used for this process and transcripts were imported into the software. A hybrid approach was used for code generation and similar codes were grouped.

- 4. **Cross-case analysis**: the coded data were examined to identify similarities and differences as well as unique perspectives across the four groups of respondents.
- 5. **Interpretation**: The researcher combined the findings from the cross-case analysis to understand relationships, key themes and implications arising from the data. This process involved identifying underlying mechanisms and drawing connections to obtain meaningful insights and conclusions.

5.6 Framework development and validation

Based on the extensive literature review presented in the previous chapters above, as well as the interviews conducted with the stakeholders, the various constructs/building blocks of the framework were identified. Interviews with experts were done to authenticate the proposed framework by investigating and explaining its viability and suitability to the identified problem.

5.7 Ethics

The following ethical issues were observed throughout this study:

Permission: The researcher sought permission from the relevant authorities – including the DCP, CPC members, NGOs, experts and community members in the form of signed permission letters.

Voluntary participation and informed consent: The researcher did not force respondents to participate. They were informed of the reason for the study and the fact that they could withdraw from the research process in the event of feeling uncomfortable during the interviews.

Privacy and confidentiality: The collected data were handled with outmost confidence.

No forgery, fabrication, fraud or falsification: The researcher ensured that the collected data were analysed truthfully and only referred to existing facts. The researcher avoided fabrication, i.e., inventing, creating or faking results and refrained from manipulating the research findings by intentionally adding or omitting certain findings for personal interests.
Academic freedom: The researcher remained neutral and shared personal knowledge and information freely throughout the entire research process, especially during the early stages of the research when the perceived problems associated with emergency and crisis response needed to be identified without any fear or intimidation.

No to plagiarism: The researcher avoided plagiarism by acknowledging the use of other researchers' work and cited all references to such material appropriately, thereby avoiding self-plagiarism, multiple plagiarism and/or redundant publication.

5.8 Reliability and validity

5.8.1 Reliability

Reliability is the consistency of a measure or instrument, indicating the stability of results over time; high reliability signifies minimal measurement error and is crucial for valid research findings, which can be assessed through various statistical methods (Zainol et al., 2023). To ensure reliability in the data collection process, the researcher:

- Employed a consistent interview protocol tailored to four groups: DCP, DRO, experts, and the community. While the questions were adjusted to align with the specific context and perspectives of each group, they were designed to achieve the same overarching objectives. The use of a structured interview format also minimised variations in how questions were posed, reinforcing consistency in the data collection process. This approach maintained uniformity in data collection across all categories.
- Conducted pilot interviews with representatives from each group to test the adjusted questions. Feedback from these sessions allowed for further refinement, ensuring clarity and relevance, which contributed to the reliability of the responses.
- Employed triangulation by combining data from multiple sources; DCP, DRO, experts, and the community. Interviews and focus groups were used. A focus group was conducted with the community and a group of NGOs who were all Directors of NGOs. Focus groups facilitated dynamic discussions, enabling participants to interact and build upon each other's ideas. This group setting not only generated a wealth of qualitative data but also highlighted shared experiences and differing opinions within the respondents, which added depth to the findings. The triangulation of data sources also served as a means of validating the findings. For example, if a theme emerged from both the interviews with experts and the discussions in community focus groups, this

convergence of evidence strengthened the reliability of the results. It indicated that the findings were not merely anecdotal but were supported by multiple lines of evidence.

Meticulously transcribed interviews from all four groups of respondents verbatim, capturing each participant's words exactly as they were spoken. After each transcription, the researcher proof-listened to ensure that the transcription matched the recorded audio. This careful process was essential for maintaining the integrity of the data and allowed for a genuine representation of the participants' responses and experiences. Following transcription, the researcher conducted multiple rounds of coding, starting with open coding to identify initial themes and significant concepts from the transcripts. This iterative process involved refining and consolidating codes into broader categories that encompassed the diverse perspectives of the participants. Additionally, the researcher maintained detailed notes throughout the coding process, documenting decision-making and any adjustments made to the coding scheme, which provided an audit trail for transparency. These rigorous methods ensured that the analysis accurately reflected the participants' voices and experiences, ultimately strengthening the reliability and credibility of the research findings.

5.8.2 Validity

Validity refers to the accuracy of a measurement and assesses whether a test truly measures what it claims to measure. It ensures that results are applicable to the intended context, making it crucial for the credibility of research findings (Zainol et al., 2023). To ensure the validity of the research findings, the researcher employed several key strategies that collectively enhanced the rigor of the study. These include:

- The use a diverse sample from various groups. This approach allowed the researcher to capture a wide range of perspectives and ensured that the findings reflected the broader context of the research topic.
- A thorough literature review to establish a solid theoretical framework for the study. This
 review informed the research questions and methods, ensuring that they were grounded
 in existing knowledge and relevant to the field. This enhanced the credibility of the work
 and demonstrate its relevance within the academic discourse.

5.9 Chapter summary

This chapter has summarised the philosophical stance of this research, the research paradigm and the methodology used by the researcher. Justification for all actions taken was provided in this chapter.

CHAPTER SIX

DATA ANALYSIS AND PRESENTATION

6.1 Introduction

This chapter presents and interprets the findings from the semi-structured interviews conducted with the four key DM stakeholders, namely the case organisation – the DCP and the committees that represent it (DRO, experts in DMA, KM and IT, and community members). In total, 26 indepth interviews were conducted with these key stakeholders. The researcher used a case study of the DCP. The DCP comprises a department only at the national level, at the provincial and district level, it is represented by committees. As such, it was necessary to interview personnel at the national, provincial and district levels. Thus, to gain a deep contextual understanding of the current DCP disaster response mechanisms from an internal perspective, the researcher included both DCP employees and their representative data points at the provincial and district level. In addition, the perspectives of external stakeholders and experts helped the researcher to triangulate the findings. External experts offered impartial viewpoints that provided a broader, multi-faceted view and holistic understanding of the DCP. Findings were corroborated and insights were cross-validated. Figure 6.1 below provides the chapter roadmap to guide the reader:



Figure 6.1: Chapter outline



6.2 Data analysis procedure and overview

6.2.1 Data preparation and management

Data collection was through unstructured interviews which were recorded on the researcher's mobile device. Four categories of respondents participated in this study and each category comprised different responders as shown in Table 6.1 below. Twenty-six interviews were conducted.

Respondent	Number of	Description and code		
Category and code	interviews			
Case Organisation	6	Department of Civil Protection (DCP) [1]		
[Case org]		Civil Protection Committee member (CPC) [3]		
		District Development Coordinator (DDC) [2]		
Disaster Response	12	Non-Governmental Organisations (11 interviews +1		
Organisation [DRO]		focus group discussion)		
Experts	7	Disaster Management Academics (DMA) [2]		
		Knowledge Management Experts (KME) [2]		
		IT Experts (ITE) [3]		
Community	1	Community Focus group comprising 8 people		
	26			

Table 6. 1 : Respondent category

Figure 6.2 below presents all 26 documents in ATLAS.ti.24

Project: Teu Thesis (Snapshot 2024-5-15 19:08:41) Report created by Teurai Matekenya (2) on 15/5/2024

Document Report – Grouped by: Type All (26) documents Text 26 Documents: 2 DRO1

- 4 DRO2
- 5 DRO3
- 6 DRO4
- **7** DRO5

	8 DRO6
=	9 DR07
=	10 DRO8
=	11 DRO12
=	12 DRO9
=	13 DRO10
=	14 DRO11
=	15 Community
=	16 Case Orga DCP
=	17 Expert_ DMA1
=	18 Expert_ DMA2
=	19 Expert_ IT1
=	20 Expert_IT2
=	21 Expert_ IT3
=	22 Expert_KME1
Ē	23 Expert_KME2
E	24 Case Org CPC1
=	25 Case Org CPC2
=	26 Case Org CPC3
=	28 Case Org DDC1
=	29 Case Org DDC2

Figure 6. 2: Document report Source: ATLAS.ti.24

All the interviews were transcribed verbatim. The transcripts were organised and uploaded into ATLAS. ti.24. Each data file was assigned a unique identifier under each stratum, in the order in which the interviews were conducted in the stratum. For example, transcripts for the Disaster Response Organisations were coded DRO, since 12 interviews were done with Disaster Response Organisations, unique identifiers were assigned from DRO1 to DRO12 as shown in Figure 6.2 above. To ensure, the confidentiality and integrity of the information, the files were password protected and these were backed up to an external hard drive together with the thesis document. The process described above facilitated the subsequent data coding and analysis process that followed.

6.2.2 Coding and theme development

ATLAS. ti.24 was used to analyse the data obtained during the interviews. As explained in section 5.5.4 above, the researcher read each script three times and to ensure an in-depth familiarisation with and understanding of the data and the key themes. This initial coding helped the researcher obtain a general data overview. Line-by-line coding followed the initial coding that involved paying closer attention to the data, digging deeper and refining the code set. The coding scheme was developed using a hybrid approach in order to remain open to themes emerging from the data while simultaneously leveraging existing theories and conceptual frameworks. The deductive approach ensured that the analysis was anchored in a theoretical foundation by starting with a set of pre-determined codes that the researcher had derived from the reviewed literature. However, there were instances in which some unexpected insights not mentioned in the literature emerged from the data and the inductive approach allowed for their identification. Some deductive codes were refined and others expanded in the process. The researcher adopted this balanced hybrid approach to acquire an in depth understanding of the case study as well as to increase the trustworthiness of the research findings.

To attain a high-level overview of the key topics and themes discussed in the interviews, the researcher generated a word cloud using ATLAS.ti.24 software (Table 6. 3) from the word cloud. The most frequently used words in the interview transcripts are disaster, information, people, resources, systems, communities and knowledge. This word cloud allowed the researcher to identify the central concepts that emerged from the discussions.



Figure 6. 3 : Word cloud

Source: ATLAS.ti.24

6.2.3 Overview – code groundedness

A total of 133 unique codes were initially identified across the 26 interview transcripts and 740 quotations were recorded as shown in Figure 6. 4.

	Teu	Thesis (Snapshot 2024-7-26 19:08:41) - ATLAS.ti – Trial Version	×	
File Home Search & Code	Analyze Import & Export To	ols Help	📮 🤛 Feedback & Help 🕐 🗸	
Add New Project Comment	Navigator Documents Quotations Codes	Memos Networks Links		
Explore • X Search Q				
 Teu Thesis (Snapshot 2024-7-2 Documents (26) 	Teu The	sis (Snapshot		
^{▶ ♦ Codes (130)} ^{p Memos (0)} 2024-7-26 19:08:41)				
B Networks (4) Document Groups (0) Code Groups (6)	The project has no comment. Click to edit comment			
 Memo Groups (0) Network Groups (0) 	Project Overview			
Multimedia Transcripts (0)	Documents	26 Created by Teurai Matekenya on 26/4/2024		
	♦ Codes	133 <u>Current user Teurai Matekenya (2)</u>		
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Figure 6.4 : ATLAS.ti.24 project snapshot

Code groundedness represents the number of times the code was applied in the entire data set. Several codes stood out as highly grounded. Under the current coordination mechanism, these included Information sharing (50 groundings), civil protection (CP) structure (25 groundings), sources of Information (17 groundings), AAR (10 groundings), training and capacity building (10 groundings). The highly grounded codes point to the role of information sharing and CP structure in disaster coordination in Zimbabwe.

Under the barriers to coordination objective, lack of resources stood out as highly grounded (53 groundings), culture and leadership (36 groundings), poor disaster knowledge management (KM) (29 groundings), CP structure (28 groundings), siloed disaster information (25 groundings), poor disaster communication (22 groundings), policies (20 groundings), politics (20 groundings), poor infrastructure (19 groundings), gaps in interagency/inter-ministerial coordination (19 groundings), intersectional approaches (18 groundings), reactive culture (18 groundings), bureaucratic systems (18 groundings). In contrast, a small number of codes had a relatively low groundedness with values below 15, these included low e-government uptake and a lack of motivation. While

they were less prevalent in the data, they still provided valuable insight into the potential challenges that must be taken into consideration in the development of the KM framework.

Under the objective on KM strategies that the DCP should adopt, technology adoption stood as highly grounded (42 groundings), capacity building (19 groundings), investment in platforms for knowledge sharing (19 groundings), engaging in partnerships for KM (14 groundings), governance, policies and legislation (14 groundings) and investing in Indigenous knowledge-based early warning systems (IK-EWS) (14 groundings).

6.3 Current coordination mechanisms and collaboration practices employed by DCP

All four groups of emergency responders answered the following research question: "What are the current coordination mechanisms and collaboration practices employed by DCP?." Each identified a coordination mechanism or collaboration practice. The findings were presented according to the different responder categories, a cross-case analysis during which the divergence and convergence of the different strata were analysed per each mechanism follows and, lastly, a discussion of findings per each mechanism is provided.

6.3.1 The civil protection (CP) structure

In this context, CP structure refers to the organised system of organisations, supporting legal and regulatory framework, funding sources and resource allocation that enable the protection of civilian populations and critical infrastructure during emergencies. A network diagram was created using ATLAS.ti.24 and shows the participants who highlighted the CP structure as a mechanism for emergency and crisis coordination in Zimbabwe (Figure 6.5).



Figure 6.5: Network diagram on CP structure as a coordination mechanism

Source: ATLAS.ti.24

6.3.1.1 Findings from the case organisation (DCP and CPC)

The findings from the case organisations reveal that the DCP's synchronising role includes coordinating stakeholders, convening meetings using the structures, giving advice, engaging other stakeholders or actors, resource mobilisation and providing an enabling environment. The DCP is the custodian of the Civil Protection Act. The Civil Protection's (CP) structure is shown in Appendix 9 attached to this report. It uses a multisectoral approach that includes government, local authorities, civic society, development organisations and the private sector both at the individual and the organisational level. This structure includes traditional leaders as part of the organogram. Each sector has its core responsibilities. The DCP exists at the national, provincial and district level, it has no dedicated individuals but is represented by committees comprising representatives from the various sectors. At the national level, the DCP is headed by a Director in the Ministry who coordinates activities. This Director relies on the advice of stakeholders, for example, the Meteorological Office, and other platforms that alert it regarding possible disasters. When it is evident that a disaster is about to strike the committees are activated. This activation calls upon the members' respective competencies and aligns who does what and when. All the stakeholders then attend the relevant committee meeting during which pertinent issues are discussed and activities assigned to the relevant people who then assist in trying to mitigate the effects of the pending disaster or emergency. At the district level, the DCP's committee is chaired by the District Development Coordinator (DDC) and at the ward level, the Ward Councillor chairs the Ward Civil Protection Committee (WCPC). Thus, the Disaster Risk Management (DRM) systems in Zimbabwe are informed by pooled capabilities and resources.

6.3.1.2 Reporting findings from Disaster Response Organisations (NGOs)

Findings from the NGOs revealed that the DCP's CP structure is clear, promoting efficient decision-making and coordination. There is a laid-out institutional framework and reporting lines are well-defined to avoid confusion during an emergency. As indicated previously, the DCP exists at a national level, it falls under the Ministry of Local Government Public Works and National Housing (MLGPWH). At the national level, this department comprises people who are solely responsible for CP matters. However, there are no offices that are solely responsible for CP issues at provincial and district levels but these are handled by the relevant committees that include: National Civil Protection Committee (NCPC), Provincial Civil Protection Committee (PCPC) and District Civil Protection Committee (DCPC). The committees bring together civil society

organisations engaged in humanitarian work, as well as government bodies such as the military and police. To further improve the management of disaster situations, the DCP has included local leaders in its organogram. The NCPC operates at the national level, and a similar structure is replicated at the provincial and district levels. At the national level, the DCP Director is the principal officer. At the provincial level, the PCPC is headed by the Secretary for Provincial Affairs and Devolution (SPAD). At the district level, the DDC is the principal officer and convenes meetings and disseminates information. Research findings reveal that this multi-level structure ensures effective coordination of humanitarian response operations throughout Zimbabwe, with the DCP taking a central role. The DCP facilitates collaboration and cooperation among various stakeholders, providing a cohesive and efficient response to emergencies and disasters. By leveraging government entities' and various organisations' expertise and resources, the DCP plays a crucial role in coordinating and mobilising the country's humanitarian efforts. Whenever there is a disaster, these structures, together with all the response teams, are activated. For example, when a disaster strikes, everything is centred at the district level

"The DCP is at the national level, at the provincial level, it's not a department but it's made up of several government departments that are coordinated by the SPAD, so he or she is the one with the coordinating function, coordinating different ministries and government NGOs at the provincial level. The same applies at the district level, it's the DDC who then coordinates efforts by the different stakeholders.... If there is a disaster, our focal person is the DDC, s/he is the one who reports to SPAD who will then, through the minister report to the national level", [DRO2].

"At the provincial level, it's chaired by the SPAD at the district level it's chaired by the DDC", [DRO3].

"There is an enabling environment in the sense that there is an institutional framework on the ground", [DRO 5].

6.3.1.3 Reporting findings from community focus groups

Data analysis from the community stratum shows that when a disaster happens, the community members approach the village head (VH) to tell him/her what has occurred or is likely to happen. The VH will take the issue to the Chief who will then contact the DDC. The DDC will take the issue further up the hierarchy and relative measures are taken that could include evacuating the affected people.

6.3.1.4 Reporting findings from experts

The findings from experts indicated that the DCP is currently operating effectively. The NCPC is well-constituted, comprising stakeholders from various sectors, and is efficient. However, there are gaps in the structure at provincial, district and levels. Some of the agents/departments that are represented at the national level do not exist at the subnational level.

"The institutional make-up is good in that the key stakeholders are there and as far as I know there is no limit in composition as long as they have some development agencies whose mandate is related to the reduction activities. That's why you would find The UN agencies, military, and Police etc, all these are available", [Expert_ DMA1].

Findings from the experts reveal that Zimbabwe, being a member of the United Nations (UN), has many policies in place including those that protect human life and the environment. However, enforcement of such policies is often lacking. Measures should be put in place to ensure that all the policies are well-implemented to support DM.

"We have a lot of vulnerabilities in communities for example, we have policies for water, on agriculture, and education, those policies are enough to protect human life and the environment in which we live but the challenge we have is the implementation. The implementation drive is the one that needs to be taken care of", [Expert DMA2].

6.3.1.5 Cross-case analysis

All four groups commented that the CP structure was an effective institutional framework for CP particularly its multisector approach. The structure is clearly defined to allow for effective DM. Funding is provided by the government and pooled from various organisations. However, the experts highlighted a gap in the structure because some organisations are not represented at provincial and district levels. This group also expressed concern over the non-enforcement of the various policies for protecting human life and the environment. This policy enforcement deficiency significantly affects disaster coordination because unproductive policy implementation undermines the overall effectiveness of the CP system. This finding points to the need for stronger accountability mechanisms and robust monitoring and evaluation frameworks to ensure policies are translated into practical action. This identified structural gap can also lead to siloed decision-making and communication breakdown.

6.3.2. Disaster information flow structure

In this context, disaster information flow refers to how disaster-related information flows vertically (from DCP to PCPC to DCPC and the local stakeholders) and horizontally (sharing of disaster information across the sector departments at the national, provincial and district levels).

6.3.2.1 Reporting findings from the Case Organisation (DCP and CPC)

When a disaster happens, disaster information originates from the community. Headmen and councillors are part of the structure and communicate with the DDC that disseminates the message to the province. However, some urgent information comes directly to the national DCP before being sent to the provincial office and official communication will follow through the appropriate structures. Urgent information does not need to follow official protocol while people are suffering or dying. Bottom-up communication and the subsequent activation of committees are primarily triggered by an early warning.

"Those affected by the disaster then get in touch with the councilor or the local leaders at the ward level who then relay the message to the DDC. So, that is what normally happens unless the situation is dire, where certain protocols are put aside and we have the community communicating directly with the DDC. But in the aftermath of a disaster, we then expect the protocol to be followed". [Case Org DDC2].

6.3.2.2 Reporting findings from Disaster Response Organisations (NGOs)

The CP's structure as described in section 6.2.1 above shapes the dynamics and pathways through which information flows within the department. For example, when information comes from the provincial level, the DCC activates the DCPC, and all the committee members are summoned to a meeting. Then the information is passed through the DRM mechanisms and the situation is reviewed. Disaster information is generated mainly at the local level from the effected communities utilise their local structures and it is through the village heads and chiefs that disaster information reaches the DDC. Thus, for bottom-up communication, the structures at the ward and the village level are empowered to collect local data and then escalate it upwards. Such data collection is facilitated by village heads and councillors. So, essentially, information flow is two-way, from DCP to the communities and vice versa. After a disaster has struck, the there is a government template that must be utlised by everyone reporting disaster information at the

community level. It records what the event is, the number of people affected and variables such as those injured, deceased and/or displaced. However, when communities report a disaster or incident, the structures can be ignored to ensure a swift response from the various organisations and, thus, save lives and property. The required structure however, can be followed after the incident:

"So sometimes the flow of information is not necessarily always from the DCP itself to the partners and actors. It's two-way, sometimes the department also gets information from actors on the ground", [Disaster Response Org 1].

"There are DRM committees at the community level. Usually, the starting point for all disaster information is the DCPC because they get their information from councillors and other community representatives. So information goes from the District to the Provincial Administrator then up to the national level", [Disaster Response Org 5].

"The starting point is the local level", [Disaster Response Org 11].

"Yeah, it's not like information respect corridors of authorities. It's only when it comes from the national level that it goes through the province then the district then the ward and then village level. Information that is coming from the communities, reaches the DDC anyhow. But of course, they make sure that they respect their protocol. But they can call the DDC directly to say here is the situation and this is what is happening right now", [Disaster Response Org5].

6.3.2.3 Reporting findings from the community

Findings from the community focus groups reveal that the affected individual(s) inform the VH and the VH reports the matter to the headman and the headman/chief passes it onto the DDC. The study respondents commented that the structure exhibits a clear and well-defined information flow process that ensures the effective dissemination of information.

"This channel of communication makes the flow of information smooth to allow those at the top to know what would have happened", [Community Focus Group 3].

6.3.2.4 Reporting findings from experts

Findings from this group revealed that, in terms of vertical information flow at the district level, the DDC works with certain community members such as the VHs, headman, chiefs and councilors. When council meetings are held the DDC disseminates information to the relevant stakeholders. The local traditional authorities (LTA) are also involved because they are the custodians of the

local communities in rural areas. Whenever routine LTA meetings are held, the members report on behalf of the communities that they administer.

6.3.2.5 Cross-case analysis

Across the groups, a shared understanding emerged regarding both vertical and horizontal information flow in the CP structure. All groups highlighted that bottom-up communication is primarily triggered by a disaster event and the communication moves along a well-defined CP structure. The case organisation pointed out that top-down communication is triggered by an EW. Information flow is well defined and communication is two-way. However, it was highlighted that in severe cases of disasters, these laid down structures can be ignored and affected communities can call directly to the DDC for swift actioning. Data is collected from the local level through the local structures. However, in contrast, the NGO and expert group highlighted that the DCP is weak in terms of gathering disaster data and that they rely on data gathered by their partners. For top-down communication, the DCP communicates disaster-related information and directives to the PCPC and the DCPC and these groups are responsible for disseminating it to relevant stakeholders.

6.3.3 Disaster Knowledge Management

In this context, disaster KM refers to how DCP acquires, organises, stores and disseminates disaster information to support DM. This process includes the technologies and strategies used to effectively manage disaster information.

6.3.3.1 Reporting findings from the Case Organisation (DCP and CPC)

Disaster information acquisition: It emerged from the findings that DCP acquires information from the majority of the relevant stakeholders and of importance is the Meterological Department for providing an early warning that acts as a trigger for the activation of the committees. At the district level, the DDC acquires the information from the citizens/community members. Once a report is made by the citizens, the DDC sets up a team to authenticate the informationi. The common modes of bottom-up communication channels used include physical visits and messages sent via phone, whatsapp and SMS. For top-down communication both national and community radios are used.

"The DDC gathers information from various stakeholders such as Local NGOs and CBO (Community-Based Organisations), Government departments – sister government departments, traditional leadership, councillors, local authorities, private sector, faith based organisation, individuals, Red Cross International Organisations, communities, sectors, academics, UN Charter, Joint assessment", [Case Org DCP].

"Primary sources are many. The first thing is that we get information from the local leaders and the community, the councillors, extension worker", [Case Org DDC1].

"Those affected by the disaster then get in touch with the councillor or the local leaders at the ward level who then relay the message to the DDC. Once they are alerted, a task force that goes to the ground is formed to assess what would have happened". [Case Org DDC2].

"When the district level gets the information from the community, they confirm first to ensure the reliability, trustworthiness and accuracy of the information. They also do team assessments before they write to the province and to us because with social media, people can lie", [Case Org DCP].

o"The NGOS, have a lot of capabilities in terms of reaching out to communities, they have also helped us in some cases to give us information, outside the victims themselves, if they can supply information", [Case Org CPC2].

"The main source [of information should be the early warning (EW). The EW must be the trigger at any point. If our EW is not up to date, we will be reacting, all the time", [Case Org CPC3].

Disaster knowledge storage, processing and analysis: The research findings revealed that the DCP lacks a centralised disaster knowledge repository at national, provincial and district levels. The information gathered at district level is typed and stored in computers and sometimes printed and filed. If staff needs any information, they must check the files.

"Currently, we do not have a central repository of disaster information but that is where we are going", [Case Org DCP].

"In terms of having a central database, this is still a bit of a challenge, normally, the information comes and is typed, a document is then printed and stored in files but to say we have an electronic database, it is not there but whatever is reported is filed", [Case Org DDC2].

"There is no electronic database to store district disaster information. We store in ICT gadgets such as flash, laptops and computers. But sometimes we store it in paper version. There is a CP file that is kept at the DDC's office", [Case Org DDC1].

Disaster information sharing: The research findings revealed that the DCP uses various channels for disseminating information, such as the radio and WhatsApp. The DDC has created WhatsApp groups for sharing information with local leadership and partners. Sometimes after a disaster has struck, a tactical headquarters which acts as the core information centre is set up. People from the various ministries are deployed and they collect data using the various ministry communication channels. Situational reports are conveyed through the radio and they become the source documents for the centre. This structure disseminates information to both the relevant stakeholders and the general public.

"Chimanimani when we created the centre, all the offices that should know the information got the information on the dot", [Case Org CPC3].

"For most areas that are prone to disaster, the DDC has created WhatsApp groups so that they communicate with the community leadership", [Case Org DCP].

6.3.3.2 Reporting findings from disaster response organisations (NGOs)

Information acquisition: The findings from this stratum revealed that there are different reporting templates for different events and sectors. When partners are established in a district, the DDC gives them the appropriate reporting template. When the partners operate within a ward, they use this template to record data and, once it is complete, they submit it to the DDC for processing. The DDC will then use the ward plans to create the central district's plans. However, the government often relies on its partners for the collection of disaster data. Their partners collect data directly, analyse it and then produce reports for the DDC and the other RDCs on a monthly, quarterly and/or annual basis. The DDC and its partners communicate using a variety of channels such as face-to-face emails, phone calls, WhatsApp messages and regular meetings. The district officials create WhatsApp groups for easier communication. However, the general findings from the NGOs revealed that the DDC is not very active regarding the collection of a disaster.

"Most of the time we are on the ground more than the government itself sometimes we are even better able to give specifics about geography of the areas where such disaster has occurred", [Disaster Response Org 12]. "To say I've seen the government collecting information, umm, I don't know. But with NGOs, normally they will do their surveys, get enumerators and go down there and collect the data. However, when it does, it normally do it through the village heads and other DRR members at the village level". [Disaster Response Org 5].

"So we always collect data when we do our programming. So what we believe is that disasters are not sudden events, there are indicators that point out to disasters. So, we gather information about the baseline level for each of the indicators that we want to intervene in anticipation of disaster. So that whatever happens, we know we can pull out some information to respond as fast as we can", [DRO12].

Disaster information storage, processing and analysis: There is no central repository for disaster knowledge from which emergency responders and other stakeholders can access information to help them make prompt and data-driven decisions. The DCP relies on information from various sources and, therefore, disaster knowledge and databases are strewn across various ministries and institutions and their partners. Findings from this group revealed that the following kinds of information should be easily accessible to assist responders make good data-driven decisions during disaster response: timeous EW, packaged in a local language so that everyone understands and through a channel that is easily accessible by the majority of the persons, especially those that are likely to be affected by that particular hazard; Hotspot analysis showing the location and demographics, the affected area, the number of people affected, the nature of the disaster, how the situation is evolving, the extent of the damage and the state of the road network, as well as the humanitarian actors already on the ground in the affected area. There should be a list of the stakeholders responding to the emergency in the area as well as their area of focus and the knowledge that the experienced researchers hold should be collected, documented and shared.

Early Warning:

"When Cyclone IDAI struck in Masvingo, I discovered that there were no early warning messages to alert the communities, if they were there, they were not effective as people were caught unaware, and they were not prepared at all", [Disaster Response Org 9]. "EWS and a list of all the NGOs or emergency responders attending to an emergency in the area", [DRO4].

Hotspot analysis:

"The demographics, look at the actual people who are affected, the areas affected, and the severity of the incident as well as the road network, how accessible the affected areas are and alternative routes if possible", [DRO6].

"Normally, we share the number of populations affected, nature of disaster, what type of disaster it is. We also share geographic aspects, location of where the disaster happened", [DRO12].

Tacit knowledge:

"The knowledge and experience of the emergency responders is very important", [Disaster Response Org 10].

However, the majority of the respondents were not sure how the collected data is processed and analysed, only a minority indicated that that the information is typed into a computer and printed reports are filed.

Disaster knowledge sharing and distribution: The findings from the NGOs revealed that the DDC utilises a communication system that facilitates seamless and reliable information exchange among emergency responders and government agencies. Meetings and joint monitoring activities are platforms via which disaster information is shared. Four top-down communication, they have radios and WhatsApp groups for communicating disaster awareness with the communities. When communicating with NGOs and other responders, the DDC uses a reporting template, emails and phone calls, SMS, radio, Whatsapp as well as physical meetings to ensure everyone has access to the latest disaster information. This information comprises of notifications of meetings convened or a pending hazard. For bottom-up communication, the community mainly use and face-to-face contact. However, sometimes power and 'e-time' becomes a challenge with phones. However, currently, the DCP does not own a website, the one they use is down and there is no stand-alone IT section within the department. This makes accessibility of disaster information a challenge.

"In our province in Manicaland, the DCP is frequently featured on Diamond FM radio to raise awareness among the public about disaster preparedness and we have WhatsApp groups made up of NGO leaders", [DRO3].

"For information dissemination, radios are also one channel that has been used but usually from national levels to community", [DRO5].

"Currently we are utilising whatsapp platforms through whatsapp groups to centralise communication, however the DCP can do better", [DRO2].

"Then NGOs normally have quarterly reviews and they've got joint monitoring activities, so information is shared through those different platforms", [DRO5].

"I know that the DCP, they have an Information Management unit, but I think the functionality of that department is something. I think it's something they are still trying to set up. So you always find an issue of the website not working, the website under development or something", [DRO1].

However, there are other organisations with platforms that provide good sources of information such as the Food and Nutrition Council, UN Agency organisations that usually provide sufficient details in terms of what is happening, specifically on the sector upon which they focus. Civil Society organisations provide information in terms of the areas in which they are operating. They may not have national level coverage as so the UN agencies but they have information pertaining to the districts and areas in which they are operating. However, the information is disjointed because each organisation collects and stores specific types data that it shares with its partners. There is no central repository of disaster information, everyone works in isolation and searching for disaster information from the various disparate organisations wastes valuable time for emergency responders.

"There is an issue of information asymmetry. Organisations collect their information then use it for their own purposes and don't share it with it with other organisations.

That's something that needs to be addressed", [DRO5].

"One source that is reliable where you would go and find all the information that you require is a platform developed by the Food and Nutrition Council. If you go to their website, yes information is organized by date and everything, is available and well laid out. But if you want information on something else, you will not be very sure where to get it. You just have to think who you think is most reliable, who is most likely to give you that kind of information. But yet if that was all on one platform you just open a separate window on that platform and say information about education is there shelter is there social protection is there", [DRO1].

6.3.3.3 Reporting findings from communities

The research findings revealed that while communities now use phones they previously relied solely on word-of-mouth for transmitting messages. They would go directly on the scene of the incident or to the headman to report what had happened. The community stratum emphasised

the importance of word-of-mouth over the use of phones because the latter presents limitations in terms of how much can be discussed or explained due to limited airtime and/or access to electricity. The VH has to verify the incident and report the issue to the headman for onward transmission.

"With word of mouth, one can explain that there is a house with 7 iron sheets swept away by the wind, the building has collapsed, a child has been trapped and is dead inside, property worth X dollars has been destroyed. On the phone, you only talk of the deceased and you summarise because of airtime or low battery, to reduce expenses", [Community Focus Group 3].

6.3.3.4 Reporting findings from experts

Disaster information acquisition: The findings from experts revealed that the DDC works with certain community members, i.e., the VH, headman, chiefs and councilors. The DDC also acquires information from the LTA who, as the custodians of the local communities in rural setups, hold routine meetings and report on behalf of the communities they administer. However, gathering information at grassroots level is sometimes difficult due to the fact that the DDC and ward councilor are located far from the communities they oversee. The experts expressed concern regarding the use of a councilor to gather disaster information for onward reporting to the DDC. They pointed out that despite the fact that the councilors represent the local government, their political affiliation can influence disaster data acquisition.

"They do not have lower-level offices, thus the distance of information transmission is very long, such that the probability of them being misinformed is very high. Once we talk of a break at the district level that's the easiest connection with ward level and village level. So if the district level is broken, it becomes very difficult for them to inform communities and at the same time, it also becomes very difficult to gather appropriate and timeous information from the lower level communities like villages, wards and so", [Expert_ DMA2]. "But, there is a challenge which I sort of contest because whenever you talk of a ward councilor reporting disaster information, there is a challenge as the person is political. Let there be a neutral figure designated to a particular area so that they become familiar with whatever is happening there and events in that area so that they report accurately", [Expert_ DMA2]. **Knowledge sharing and distribution:** The research findings indicated that when council meetings are held, the DDC disseminates information to the relevant stakeholders. The DCP also uses various platforms such as WhatsApp, national radio stations and flyers for disseminating information. However, the respondents felt that the DCP could improve its information dissemination.

"They are supposed to make noise on radio, distribute flyers- like the ZTSC, towards public holidays, they mount exhibition tents where they give flyers, they give information about traffic safety. The CPU is supposed to do the same. Making those intentional efforts to make sure that everyone is aware", [Expert_ KME1].

6.3.3.5 Cross-case analysis

A common thread across all four stakeholder groups is the recognition that information and knowledge acquisition by DCP occurs through a multi-layered approach. For bottom-up communication, information is gathered from the communities through various structures, using communication channels such as phones, WhatsApp, SMSs, physical visits and regular monthly meetings that the DDC holds with LTAs. Sometimes the DDC needs to verify the reported information. The DCP acknowledged the NGOs' role in collecting data at the community level through their direct involvement with the affected communities, while NGOs pointed out the weak data collection by the DCP. Despite the complementary nature of the coordinating organ and the NGOs, this finding has a significant implication for effective disaster coordination. The DCP's reliance on others may result in delays, gaps or misalignment of the information available for guiding decision-making. The experts highlighted a gap in information gathering – the DDC does not have sub-offices close to communities, thus, information transmission is slow which increases the probability of misinformation. For NGOs to make sound decisions, they need early warning messages, Hotspot analysis, stakeholder mapping and the tacit knowledge held by experienced responders.

There is general agreement across all four groups that there is no central repository of disasterrelated information at all levels. Information gathered is typed and stored on various electronic devices such as computers, laptops and flash disks. Sometimes the documents are printed and filed for future use. There are also no disaster information-sharing platforms under the purview of the DCP. Various organisations house relevant disaster information, however, the information is siloed and there is no central place for storing and/or retrieving all the information. For top-down communication, the DCP uses WhatsApp and radio networks. During complex disaster scenarios an information centre is usually set up that acts as the major source of information for all stakeholders. The DDC and the partners communicate using emails, phone calls, WhatsApp messages and regular meetings. However, experts expressed concern over the infrequency of disaster-related messages that are disseminated to citizens in preparation for/during a disaster. WhatsApp currently is the common channel used for information sharing, however, the community highlighted that word-of-mouth is more effective due to airtime and electricity issues.

6.3.4 Interagency Coordination Committees and interagency collaboration

In this context, interagency coordination committees comprise the various stakeholder teams formed or organised by the DCP. Such groups bring together individual representatives from various agencies and organisations to coordinate DM efforts. Interagency collaboration refers to the formal and informal processes of information sharing, cooperation and joint activities by the various organisations involved in DM.

6.3.4.1 Reporting findings from the case organisation (DCP and CPC)

The key finding from this group is that CP in Zimbabwe brings together representatives from different departments, agencies and organisations that are involved in disaster response and recovery that provides a platform for information sharing and collaboration. One such platform is the sector approach, which is organised around specific thematic areas such as water, sanitation and hygiene (WASH), shelter, education and protection. Each sector has a lead agency responsible for coordinating the various responses and activities of the organisations within that sector. The parent ministry for that thematic area leads each cluster together with the lead partner.

"We no longer have clusters – they are now called sectors. The Government Ministry will be the lead agent.t. Reporting from the government, the ministry which is the lead agent should lead this", [Case Org DCP1].

"Normally, when a disaster is declared, we also have the assistance of the UN Agencies, the ECO, FAO, UNICEF, and WHO, they would work with the local responsible subcommittees of CP", [Case Org DDC2].

6.3.4.2 Reporting findings from disaster response organisations (NGOs)

The findings from this group revealed that the DCP has a good coordinating mechanism whereby stakeholders come together and share information about their respective areas. It emerged that there are many issues in which the DCP may be directly or indirectly involved, such as the cluster coordination that is in-country, the Anticipatory Action Communities of Practice, Humanitarian Country Team, the NGO Forum. The goal of all these committees is to foster information sharing, joint planning and collaboration among different response agencies.

Cluster Approach: The findings revealed that humanitarian actors belong to different clusters such as protection, education, food security, livelihoods and shelter. The DCP may only participate in some of these groups through the sector meetings. The cluster approach involves humanitarian actors coming together to share their knowledge, resolve issues jointly and align their activities to avoid duplication of efforts. The humanitarian actors in the same sector also pool capacities, expertise and resources and work towards a shared goal. The cluster approach also follows the structure described in section 6.2.1 above. It has members at the national, provincial and district levels as expounded by the narrative below. However, it emerged from the research findings that there is a lack of inter-cluster collaboration. To ensure a comprehensive response, the outputs from one cluster must be an input to another cluster. Owing to the interdependencies, there is a need for close collaboration and communication between the clusters. However, there is limited information sharing amongst the different humanitarian clusters. Each cluster usually possesses valuable information which the other cluster may need that remains isolated. This leads to missed opportunities for synergy, resulting in inefficient resource allocation. There is a lack of a centralised knowledge repository that captures real-time updates on how the disaster is evolving and how clusters are responding to help responders in other clusters adjust their strategies during a disaster.

"But clusters become normally the main interagency coordination system. At the district level, there is no replication of the Protection cluster but they are all now bunched into the District Civil Protection Committee. For example, the WASH cluster becomes the District Water and Sanitation Committee (DWSC) subcommittee at the district level, and the Food Security cluster is not replicated as the Food Security cluster at the district level but becomes the District Drought Relief Committee and it's only activated when there is a drought. But at the national level, the Food Security and Livelihoods cluster is in operation throughout", [DRO 1].

"So, for bigger disasters, they have what they call Joint Operations headed by the Parent Ministries, the security forces and then government line Ministries will coopt the organisation with the first-line responders that they have under their jurisdiction. These meetings will happen if the disaster is bigger or worse, they will happen daily so that daily updates can be relayed to the strategists or central command offices", [DRO 12]. "So there are various pieces, but at the end of the day, all that information that is shared in each particular cluster has to find a central point where it is made official, and that is the

DCP", [DRO 1].

The anticipatory action communities of practice (AACoP): The research findings revealed that even though the DCP is supposed to be the lead, the AACoP was advocated by civil society organisations and the DCP embraced the idea.

We also have other coordination platforms, such as the AACoP, where the DCP also plays a leading role. Ideally, the DCP is supposed to be the lead, but it's something that has been advocated for by Civil Society organisations to have the AACoP, which focuses on taking action before a disaster strikes, involving disaster preparedness actions", [DRO 1].

Humanitarian country team (HCT)

"There is also the humanitarian country team (HCT) that may involve the DCP, heads of UN agencies, and heads of CSOs. It's another platform which is separate from the clusters. This platform (HCT) is at a higher level. So it's another level which might become active during a humanitarian emergency", [DRO1].

Non-governmentalal forum: This body is usually a platform for NGOs offering similar services in the same cluster to meet and discuss issues of concern. This practice avoids duplication of effort and maximises resource utilisation.

"The DCP, in their role, they mobilise resources by bringing together partners in the same cluster. They facilitate the meetings where the DA's office would want to understand what the partners have at hand to distribute to the affected communities to avoid duplication of efforts and to ensure people work in a more coordinated manner", [DRO8].

"NGOs meet and discuss, share experiences and learn from each other", [DRO11].

"An NGO forum, where the NGOs meet and discuss, they will try to avoid duplication of effort", [DRO6].

6.3.4.3 Reporting findings from experts

The findings from experts revealed that, currently, various agencies are collaborating with the government in support of/or complementing government effort in DM. There is a need to improve and widen the scope of these engagements. The experts emphasised the importance of putting politics aside and ensuring that they gather and disseminate disaster information free of political motivation.

6.3.4.4 Cross-case analysis

The findings highlighted the importance of the cluster approach in disaster coordination in the Zimbabwean context. Both the NGOs and the coordinating organ identified the cluster approach as a well-recognised platform for information sharing, collaboration and coordination of disasters among agencies. However, despite the significance of the cluster approach, the NGOs identified a weakness in inter-cluster communication. They pointed out that the siloed nature within the cluster can hinder the overall coordination and integration of the response effort. The experts recommended extra effort on the part of DCP to engage with more partners, however, they also emphasised the need for avoiding political affiliations in the process. It is important to address the barriers in inter-cluster coordination to ensure a more holistic responsive DM approach in Zimbabwe.

6.3.5 Capacity Building

In this context, capacity building refers to DCP's efforts to develop and strengthen the knowledge, skills, capabilities and resources of individuals, organisations and communities to prepare them to respond to and/or recover from disasters.

6.3.5.1 Reporting findings from the case organisation (DCP and CPC)

The findings from the case organisation stratum revealed that in its effort to improve the overall effectiveness of DM, the DCP employs capacity building and training for the response organisations and the community members. However, it emerged that the DCP works with partners who fund most of the training programmes. The NGOs were commended for sponsoring these capacity-building initiatives. In addition to the training sessions and seminars, the CPC proposed having simulated events of disasters during which disaster is instigated and the state of preparedness is tested. It was not clear from the respondents how the effect of training programmes is evaluated.

"DCP has also done Community-Based Disaster Risk Management (CBDRM) training programs, especially in disaster-prone/flood districts. However, we do not do it as DCP alone, we have a well-equipped team of hazard experts that we work closely with, for example, capacity building related to the environment, we work with EMA (Environmental Management Agencies)", [Case Org DCP].

"So we have capacitated every member of the CP. Then those are the same cadres, who will then go and train in wards. Then we also have partners in DRM who come in to assist because at times we might not have resources. We have a challenge on resources to go and train all the wards", [Case Org DDC2].

"Seminars have been sponsored by the NGOs. We have to give them credit, thats how they also contributed in terms of trying to improve this coordination aspect. However, what I have wished for is.... meetings alone and having these seminars for one week, staying in hotels, good food and good everything, yes, that is nice, but does it really add value to what we want to achieve?", [Case Org CPC2].

"At the moment I am not aware of an evaluation mechanism in place, All I know is it takes people, should I call them training?, they are just seminars and meetings, where people are updating each other's on this and that..", [Case Org CPC2].

6.3.5.2 Reporting findings from disaster response organisations (NGOs)

There were mixed views from the NGOs because the majority of those from this stratum indicated that, despite the importance of joint training in allowing responders to practice collaboration, coordination and communication in controlled environments, the DCP does not conduct joint training sessions and exercises that involve responders from different agencies. They cited that the DCP might be willing to do so but a lack of resources limits the implementation of such plans. A minority, however, agreed that the DCP offers practical training. They commended the DCP for raising awareness through the use of radio.

"They do not offer joint training to my knowledge, the DCP is always constrained when it comes to resources", [DRO1].

"What I'm sure of is they are responsible for coordinating and mobilizing the resources and even calling for meetings. As for joint training, I am not sure", [DRO6]. "So in terms of capacity building for the locals, there are no tangible visible activities that I can talk of, however, it's in the pipeline. But you then experience after a disaster strikes that people were not prepared", [DRO4].

"Locals lack training and they need training", [DRO11].

"The DCP yes facilitates joint training – they mainly focus on case management. They offer very helpful pieces of training, however, it's important to have the pieces of training frequently" [DRO10]. "The DCP is frequently featured on Diamond FM radio, raising awareness among the public about disaster preparedness. They provide valuable information such as what individuals should do when there is a disaster, and who they should contact in the event of a disaster in their respective areas", [DRO3].

6.3.5.3 Cross-case analysis

This cross-case analysis exposes contrasting perspectives on DCP's provision of training and capacity building for partners and the communities. The DCP highlighted that it offers training programmes for both community members and its partners, with the support of partner funding and hazard experts. There, however, was a contradictory perspective offered by those NGOs who stated that the DCP lacks funding and resources to carry out such training programmes. Although partners complement government efforts in DM response, the lack of funding as perceived by the NGO group raises concern about the accessibility of these initiatives across all the districts in Zimbabwe. This fact undermines the distribution of knowledge and skills among all stakeholders and, ultimately, the overall effectiveness of DM response in Zimbabwe.

6.3.6 Implementation of the incident command system

In this context, an ICS is an approach to emergency response that is widely used across sectors. It provides a unified command, clear organisational structure, resource management and communication protocol.

6.3.6.1 Reporting findings from the case organisation (DCP and CPC)

Evidence from the case organisation revealed that there were mixed views on the implementation of the ICS by the DCP.

"Whenever there is a disaster or emergency, a command centre is set up with toll free lines. The key members within the Command System include the Min of Local Government (represented by the DDC), the Local Authority, represented by the Chief Executive Officer, Zimbabwe National Army operation on the ground, Zimbabwe Republic Police, the President's office and also the Prisons. These are the people that we would always see in the Command Centre". [Case Org DDC2].

"We are not sure of the terminology- we call it a unified command system. We only do this when doing simulations- we do it in theory - on the ground we just respond – as long as lives are served." [Case Org DCP]. "When we went to cyclone IDAI, you would find that each department that went there tended to have its own command centre – which means no corresponding of information but we are all chasing the same information". [Case Org CPC2].

6.3.6.2 Reporting findings from Disaster Response Organisations (NGOs)

Findings from the NGO stratum reveal that some participants were not sure whether the DCP utilises the ICS in its coordination role while others were sure that it utilises. They pointed out that this is where disaster information will be received and disseminated. Local radio networks like Chimanimani FM are ropped in to channel out information to affected communities including situation reports.

"I think the DCP uses the ICS". [DRO6].

"Depending on the nature of the emergence there is a command centre like what we had during Cyclone IDAI, the DCP established a command centre". [DRO 1] "Yaaaa, ICS yes, I think they use (respondents however doubted)". [DRO3].

"Not that I know", [DRO 2].

"Its more active when its election time and not for disaster. If they could use the same system during disaster, to say we are announcing this disaster situation in Mutare and this affects people in Chipinge, Nyanga, Chimanimani, Buhera", [DRO4].

"They do, but what happens is we are still using the Top-down approach. Something has to be of national magnitude for the top-down approach to work. A disaster might happen but if it doesn't affect a certain number of people, it may not be seen as a disaster. We do see some stakeholders using that, but then the response tends to be limited in terms of that", [DRO12].

6.3.6.3 Reporting findings from experts

Evidence from experts pointed out that what is more critical in setting up an ICS is where the information is coming from. When a command center is established at provincial level, the CPU seems to be out of touch with the communities that they are supposed to help. Most of the provincial centers are in the urban areas where in terms of resilience, you would find people with better resilience as compared to the rural areas.

"I would recommend a collaborative approach rather than the command approach which uses like a macro scale approach which uses little of collaboration. The moment we study communities- are vulnerable manner - the distance is too long Thus the command approach works but with limitations", [Expert_ DMA2].

6.3.6.4 Cross-case analysis

Varying perspectives on DCP's implementation of the ICS are revealed in this cross-analysis. The DCP pointed out that they mostly use the ICS during simulations. However, they emphasised that the idea of any response effort is to save lives and property rather than strictly following the system. This same line of thinking was echoed by the NGO stratum, some respondents criticised its top-down approach that works well only for disasters declared at the national level. While others were not sure about the DCP's implementation of the ICS. The experts also identified gaps in the ICS and recommended a collaborative approach rather than a command approach. These findings have a significant implication on DCP's ability to respond effectively to emergencies. The lack of a common understanding and consistent application of the ICS, as well as the perceived limitations of the system, could hinder the coordination, information-sharing and overall effectiveness of disaster response efforts.

6.3.7 Memorandum of Understanding (MoUs)

In this context, a MoU refers to an agreement between parties that outlines the terms and conditions of a partnership and establishes a framework for collaboration and mutual understanding between the parties involved.

6.3.7.1 Reporting findings from the case organisation (DCP and CPC)

Findings from this group revealed that the DCP does call for partners to assist the communities in the event of a disaster but do not limit responders by requesting the signing of MoUs while people are suffering.

6.3.7.2 Reporting findings from disaster response organisations (NGOs)

The findings from the NGOs highlighted that in order to operate in the affected community, there is a need of an MoU to be signed between the organisation and the rural district council (RDC) concerned. The DCP should first ensure that all disaster response organisations wishing to assist the affected community have a MoU with the local authority before it accesses the community. In those MoUs, the NGOs pre-empt their objectives and the activities they will be implementing. This process ensures that the emergency responders wishing to assist the affected community are bound by some rules and guiding humanitarian principles. The study respondents explained that MoUs help in coordination and prevent responders from hurriedly entering affected districts with excessive supplies of certain items while lacking other essential commodities. This structured coordination system ensures that everyone receives assistance and that no community is left disadvantaged. These MoUs are a way of establishing accountability and act as mechanisms to ensure that response efforts do not harm the people they are seeking to assist. There was unanimous agreement amongst the responders on the importance of MoUs, however, the procedure or the time that it takes to process such documents needs to be decreased. However, some responders opined that MoU is not a legal requirement but just a circumstantial request by the Ministry of Local Government, Public Works and National Housing. However, depending upon the magnitude of the disaster, these requirements are sometimes lifted. For example, during cyclone Idai, the DCP permitted responders to intervene without a MOU.

"I don't think it would be prudent to say anyone can access an area and say we are offering humanitarian assistance. Because you also risk doing more harm to the people you are seeking to assist", [DRO1].

"The process of seeking approval is not very effective as the process might take time while the affected community is suffering. I recommend that once the NGOs are registered to operate in Zimbabwe, when a disaster strikes, the organisation should be free to go straight into the affected community rather than waiting for paperwork while the affected community is waiting for help", [DRO8]. "I am not sure there because of the new PVO Act. There has been some confusion a lot. The Act itself does not outline anything on MoU. But unfortunately, the sole funders of the PVO Act are silent on MoU but the MLGPWH is the one that has been talking about MoU and its not written anywhere. The DSD assumes that your registration falls under DSD and you can operate from anywhere within the country as long as you are registered as a PVO. So these things tend to be circumstantial". [DRO12].

6.3.7.3 Cross-case analysis

Divergent views are highlighted in this cross-case analysis on MoU as used by the DCP in allowing responders to assist affected communities. The NGO group expressed concern over the lengthy process of being accepted to work in the affected community, while people are suffering. This bureaucratic process has negative implications on the effectiveness of disaster coordination because it affects the timely deployment of assistance and resources to the affected communities. However, contrary to this statement, the DCP claimed that they proactively call upon partners to come and assist the affected communities and, hence, there are no delays in processing the MoU. The NGOs observed that the Ministry responsible for the registering the NGO does not require the MoU, however, it is the MLGPWH that requires MoUs. This disconnect between the findings on the MoU process implies that there is a need to either streamline the process of being accepted to work in an affected community or there is a need for greater transparency to ensure a more coordinated system that prioritises the needs of the affected people.

6.3.8 SOPs

In this context, a SOP is a set of detailed, written instructions or step-by-step processes to be followed during emergency response operations. It provides a standardised framework to ensure the efficient and coordinated management of various disaster-related activities.

6.3.8.1 Reporting findings from the case organisation (DCP and CPC)

The findings from the CPC members indicated that the DCP has SOPs in place while the DDC indicated that they are mainly guided by the CP Act and were not sure of the SOPs.

"They have SOPs and the last update was after Cyclone Idai because it was a complete variation", [Case Org CPC3].

"They have, but where it lacks a bit is on how these SOPs govern the individual departments that are affiliated to CP. I don't have provisions within the SOP, that actually compel me that if CPU says this has happened, we must do this, I must then do as directed. But the SOPs are there. I don't know how often they are updated", [Case Org CPC2].

"Normally we are guided by the CP. The guidelines that we normally follow are those provided by the CP Act, then the Sphere that also provides guidelines on working with survivors that would have survived the disaster. The Sphere gives international standards for how then we work with affected persons", [Case Org DDC2].

"The major document that guide us is the CP Act", [Case Org DDC1].

6.3.8.2 Reporting findings from disaster response organisations (NGOs)

The findings from the NGO stratum indicated mixed views amongst the responders on the availability and implementation of SOPs. Some emergency response agencies were not sure of whether the DCP has SOPs in place to guide emergency response operations. While others were certain that the DCP does develop SOPS that outline workflows and best practices for disaster scenarios. These SOPs provide a common framework for coordination ensuring consistent response across agencies.

"Yes, they do. They are outlined from the CPU. Eg from the DRRM, they have procedures on how to mobilise, who to call, who to meet and so forth. So normally, what they do is invoke the multisectoral approach outlined in the DRRM response guideline. There is a booklet produced by the Civil Protection Unit with guidelines for all players who respond to disaster in the country", [DRO12].

"They do have protocols. For example, we knew how first responders should relate with people in the community, evacuation areas- the list of gazetted schools. It's now done in a much more coordinated effort through the DCP", [DRO3].

"I may not be very sure of SOPs that you would find at DCP. But I can say definitely at Cluster levels there are, for example, the Protection cluster, Education cluster etc. you have those SOPs", [DRO1].

6.3.8.3 Cross-case analysis

Contrasting perspectives on the availability and implementation of SOPs by DCP are revealed in this cross-case analysis. The CPC members acknowledged the availability and implementation

of SOPs, however, they identified a gap in enforcement because some members who complement the DCP's efforts fail to adhere to SOPs. One then wonders whether the organisations are aware of the SOPs or just decide not to follow them, thus, questioning the effectiveness of the SOPs. The DDC indicated that the CP Act guides them. The NGO group had mixed views with the majority citing that the DCP does have SoPs in place while a minority were unsure. The gap in lack of adherence to the SOPs, and lack of knowledge on their availability shows a lack of accountability on the part of DCP that hinders effective disaster coordination. Without SOPs, the chances of fragmented and uncoordinated efforts increase.

6.3.9 Disaster debriefing and knowledge sharing

Disaster debriefing and knowledge sharing refers to the DCP's reviewing and reflecting on the challenges, experiences and lessons learned during an emergency response or recovery operation.

6.3.9.1 Reporting findings from the case organisation (DCP and CPC)

The findings indicated a general agreement that the DCP carries out AARs. The respondents pointed out that the DCP rides on its multisector-approach strength. The committees comprise experts in various fields. As such, for AAR, experts in research and information gathering lead the AAR processes and help in turning them into lessons that the committee can draw from. The respondents commended the comprehensiveness of the information gathering process that took place after cyclone IDAI. However, one major concern that they raised was the issue of putting the lessons learnt into practise.

"At the end of the day, it should be CPU who should be the custodian of all these information drawing from all the various departments who were involved. It's CPU to do that and it has done that as far as I am concerned. But then, using now this knowledge and information to then improve future mitigation and response, it's where I have a lot of questions", [Case Org CPC2].

"That is still a weakness, if we look at the load of data that has been created by the DCP, for a month, interviews were being done to generate the data. All that should now be accessible, but am not sure if this is available except for reports", [Case Org CPC3].

"There is always a feedback meeting that happens, just to see what went wrong and see how this can be avoided. Yes there are documented lessons", [Case Org DDC2].
6.3.9.2 Reporting findings from disaster response organisations (NGOs)

The findings from the NGOs revealed mixed feelings from respondents with some stating that the DCP does not carry out AAR and others some saying that they do, however, according to this stratum, the conducting of AAR is questionable and the results are not documented.

"That platform is there through the office of DDC", [DRO4].

"Yes mechanisms were there in place to capture lessons learned, but I am not sure though who facilitated them", [DRO6].

"They are there, some of them may not be documented, if documented, you hardly have them shared across. If they could be shared with stakeholders, that would make life easier", [DRO2]. "Yeah they do, but usually, they will just be telling you - here we have 27 partners operating in the district but when we called for support only 12 managed to come. Where were the others? Are you still operating in this district or what? So you will be frustrated when you go there because you need to answer this question and that. Sometimes you are undressed in front of all the other guys. So it's very frustrating", [DRO5].

"Never heard of it. NO", [DRO3].

"Maybe the lessons are there in their offices, but disseminating the information to NGOs and the locals in the community, I have never seen or heard of it. NO!", [DRO8].

6.3.9.3 Reporting findings from experts

There are so many lessons that have been learned in past disasters. After AARs are completed lessons are learnt, however, the challenge is in adopting and implementing these lessons.

"We have learnt all those lessons. So, what is lacking is implementation. We need to implement all those lessons." If we make use of them and they do their calculations, let's not put the results on the shelf. Let's implement whatever we have", [Expert_DMA2].

6.3.9.4 Cross-case analysis

The DCP acknowledged the strength in the composition of the CPCs. AAR is undertaken with the committee members who are experts in information gathering and research leading the process. However, CPC members identified a gap in how the gathered data is then stored, accessed by those who need it and shared among the responders. They also expressed concern about the application of the generated knowledge. This concern was supported by the NGO group and the experts. However, the NGO group had mixed views regarding the matter with the majority

agreeing that the DCP carries out AAR. In addition, they expressed dissatisfaction with the way the AAR is conducted. This perceived inability of DCP to effectively gather, document and disseminate the lessons learned from past disaster events can hinder continuous improvement and, hence, the effectiveness of disaster response in Zimbabwe. This gap can result in the country constantly repeating the same mistakes.

6.4 Potential barriers to effective coordination and information sharing among emergency responders

6.4.1 Civil protection structure

In this context, CP structure refers to the organised system of organisations, supporting legal and regulatory framework, funding sources and resource allocation that enable the protection of civilian populations and critical infrastructure during emergencies.

6.4.1.1 Reporting findings from the case organisation (DCP and CPC)

The findings from the CPC members revealed that although the CP structure in Zimbabwe is clearly laid down with clear lines of reporting to support swift transmission of information, together with a multisector approach using CPCs, this structure presents some limitations. The fact that there are no CP offices at the provincial and district level with people solely dedicated to emergency response has some implications on the effectiveness of the DCP. The DDC and SPAD already have their other primary duties, CP matters then become secondary. As a result, becoming proactive in such scenarios becomes a challenge because there is no time for initiating disaster related researches and other proactive duties.

"These representatives have other or rather their own duties for example, the DDC, zvemachiefs, distributing mbeu etc zvinenge zvakamirira same person iyeye. (The DDC is overwhelmed with work. Issues related to chieftainship, distribution of farming inputs, and other responsibilities are all part of their purview).". [Case Org DCP].

"There is supposed to be a person designated for CP at the Provincial level and at the District level. Unfortunately, that has not come to fruition and they are still using the DDC as the person responsible for coordinating disaster activities. That will also lessen the burden on the DDC because he has other duties to perform. If we look at issues to do with database management etc., we will have a person whose sole purpose will be to put such things in place", [Case Org DDC2].

"What I find missing within the NCPC is the participation of local authorities. You would find that their voice is minimal yet they are the first responders when disaster happens", [Expert_DMA1].

6.4.1.2 Reporting findings from disaster response organisations (NGOs)

The findings from this stratum revealed that there is a shortfall in the DCP structure. Some organisations that are represented at national level may not be represented at district level and this gap causes a disconnect because information discussed at a national level may not cascade down. There are some structures at the national, provincial and district level that are not found at the ward and village levels. As a result, when a disaster happens, the district-level structures have to assess the situation in the communities. This practice is time and resource-wasting and makes disaster coordination less effective because whenever there is a disaster report, the district structure has to be activated to provide information to community members and access data from them.

"That might create a bit of disconnect now on what is happening at the national level and what is happening at the district level if organisations that are represented at the national level don't particularly have an office in a particular district. Then the information regarding what is discussed at the national level may not cascade to the district", [DRO1]. "And in most cases, if ever there is a disaster, it calls for the district level structure to go and do an assessment yet this can be automatic if the ward and village systems are there.

They can just activate the systems and they get all the information that they require", DRO2].

It is also not very clear on procedures relating to governance, especially when a disaster is specialised and managed by a particular ministry. For example, in a cholera outbreak or any health-related disaster, the Ministry of Health becomes the main responder. Sometimes barriers exist regarding information sharing, data sometimes is not released in time to ensure a prompt and effective response.

"Depending on the type of disaster, some disasters are managed within certain government departments eg, cholera, its Ministry of Health. If they don't want to respond or give you adequate information then? The DCP can come in, but if the Ministry of Health cannot give you the information, what do you do? It goes back to governance issues". [DRO2]. Centralisation of decision-making in DM also presents challenges especially when a disaster has struck at a district level and emergency responders require information from the district to make response decisions. Sometimes, depending on the nature of the disaster, it can be difficult to attain the required information before the district receives the 'go-ahead' from the province. This overly bureaucratic structure causes delays in responding to disasters.

".....because maybe they can't divulge figures at district level before they are allowed to do so by the national structure. But in the meantime, people will be suffering", [DRO2].

The findings also revealed a gap in the composition of CPC, individuals are drawn from government line-ministries and other response organisations. This constitution presents challenges in terms of commitment.

"We are talking of people who have other mandates and CP comes in as an extra job because you are drawn from your ministry, when you are responding, at times it could be you have put your day-to-day job on hold and that will be waiting for you once the response effort is over", [DRO2].

"You'll find out that most of these district heads are the ones who make up these committees. Sometimes their attendance in the committee meetings is not always continuous. When presented with competing or conflicting activities, they would rather prefer activities that fatten their pockets. They will then delegate the CPC meetings, making continuity and sustainability a challenge. You would find for every meeting you first need to update these new guys what you would have discussed previously. That is time-wasting", [DRO6].

"So you would realise that the DDC oversees others – but those structures also have their central command. So for example, for you to mobilse the DSD, DSD has to wait for a different command from the national office or provincial office. And then, another ministry also has to to do that. So it only less than 2 years whereby the full authority of the DDC has been validated in the ministries. There is no central command per se because DSD for them to use resources allocated, there has to be authorisation from the higher offices. That authorisation might not come in time for action to be taken. Because if everyone has to talk to their national offices and then information has to cascade back that eats into a lot of time". [DRO12].

The findings from the NGO stratum highlighted a gap in the sector approach despite being one positive mechanism for disaster coordination and collaboration. It emerged from the findings that

its structure and composition at national and district levels create information gaps. Some organisations represented at national level might not have offices in a particular district. This situation then creates information gaps at that particular district, thus, personnel might not be aware of what is being planned at national level.

6.4.1.3 Reporting findings from community

The findings from the community stratum highlighted the issue of distance that has to be travelled by a community member who needs to report an incident at the DDC's office. Respondents indicated that often the DDC's office is very far away from where the incident has happened and, thus, travelling to the disaster area to assess its effect becomes a challenge, leading to long response times.

6.4.1.4 Reporting findings from experts

There are no DCP representatives at the provincial and district levels

6.4.1.5 Cross-case analysis

Several gaps within the CP structure have been revealed by the cross-case analysis. The CPC members, NGOs and experts all highlighted a gap in the lack of dedicated CP personnel at the provincial and district levels. They indicated that provincial and district staff are already overwhelmed with their primary duties and, thus, adding CP matters to their already heavy work schedules limits the implementation of proactive disaster-related tasks, such as research. In addition to this concern, the NGOs also noted that the absence of structures at the ward level has negative implications on response times because the district personnel have to visit the affected community to carry out assessments in the event of a report. They also identified a lack of clarity in roles and responsibilities, especially when specialised ministries take over disaster coordination. This situation leads to ambiguity and delayed information exchange. Another gap identified by respondents revolved around decentralised decision-making when district-level officials fail to communicate disaster information before receiving approval from the province. Another gap identified by the NGOs was the issue of continuity and sustainability because heads of departments who are members of the CPC may delegate CP responsibilities when faced with competing priorities. Due to their needs, the community representatives pointed out the issue of

the distance between the disaster areas and the DDC's office. All these gaps associated with the structure have implications for the effectiveness of disaster response in Zimbabwe.

6.4.2 Disaster Communication

In this context, disaster communication refers to the systems, processes and strategies that the DCP employs to effectively exchange critical disaster information before, during and after an emergency response.

6.4.2.1 Reporting findings from the case organisation (DCP and CPC)

"We don't have a one-size-fits-all all in attending to disasters. Communication has to be context-specific [Case Org DDC2]. ""Language, there is Ndau on this side, and different Shona words might mean different things to different people" [Case Org DDC2].

"...we have had a lot of false calls of disaster, where we are told such and such a thing happened", [Case Org CPC2].

"People with disability for example, some of the flyers sent out were not translated to cater for the blind", [Case Org DCP].

6.4.2.2 Reporting findings from disaster response organisations (NGOs)

The following communication sub-themes emerged in interviews with the NGOs: bureaucratic CP architecture, politics of information, gaps in communication, communication infrastructure and preparedness of various actors.

Bureaucratic CP architecture: The NGOs highlighted that DCP systems are bureaucratic, especially considering the mandate of the department that is to coordinate disaster. Certain types of information have to be approved by the national office before the information can be distributed or shared publicly. This process hinders the swift flow of information and, hence, the response efforts. Sometimes even information that appears to be public knowledge has to be officially validated for public consumption. Information respects corridors of power and the DDC sometimes has to wait for national or provincial approval to disseminate crucial data. Information is usually delayed when the DDC is not in office.

"It's always bureaucratic, sometimes you need the DDC to sign off the information then the DDC might tell you that we can't take a position because the provincial administrator"

hasn't said its official". [DRO1]. "There is too much bureaucracy in government. In some cases when the DDC is not around, it means someone cannot divulge certain information". [DRO6]. "The organisational structure and hierarchies become a barrier when people respect corridors of power and where information must only be disseminated by so and so- and it only has to follow this protocol", [DRO5].

"There are bureaucratic structures that hinder the swift flow of disaster information", [DRO7].

Politics of information: The findings revealed the existence of politics of information that is characterised by the delayed release of disaster-related information, withholding the information or even downplaying statistics related to a disaster. There are quoted incidents of delayed responses to the declaration of disasters, delays in providing crucial disaster information and declaring the disaster – at times disaster information is downplayed, withheld or distorted. The findings revealed that such practies impairs SA and distorts the perception of responders towards the actual scope and severity of the disaster. As a result, the responders make decisions based on inaccurate information and, consequently may underestimate or overestimate the resources required within the time-constrained environment, hindering the effectiveness of disaster response.

"It's the politics of information. Take for example, why the current cholera outbreak was never declared a national or humanitarian emergency. You know declaring something humanitarian emergency on time opens up the space for donors to bring in money and all that", [DRO1].

"At times when some of these disasters occur you are not well informed. You will be moving from one office to another looking for information in terms of how then can you respond, how many people are affected. So at times there are issues around downplaying the figures and managing figures so that you don't want to be seen as you have failed". [DRO2].

Gaps in communication: The NGOs' findings in relation to the Cyclone IDAI revealed that the authorities failed to communicate the seriousness of the impeding cyclone. The intensity of the warnings and contextualisation of the messages presented a challenge. This deficiency led to a misperception of the actual risk level among the affected population, resulting in complacency as some members did not even take heed to the directive to move to higher grounds and failed to evacuate. Communication through flyers was also in English, a fact that hindered comprehension

among non-English speaking populations. A lack of trust was perceived between the DCP and the communities. Fortunately this breakdown in credibility and trust between the various stakeholders was repaired during subsequent disasters.

"During Cyclone IDAI, the Metrological Department did warn people, but those people are saying the warning wasn't that intense. They say the warning was just like the usual floods. So am not sure who was wrong", [DRO6].

"During cyclone IDAI for example, flyers were in English yet some people could not comprehend the language. As such disaster information should be in the local language to ensure that the message is understood by all", [DRO8].

The findings from the NGOs identified communication that was generalised to the whole disaster area as a source of ineffectiveness in disaster response. They highlighted that situations can differ even within the same district. These findings also revealed that the DCP currently does not use inclusive communication strategies for disaster response. Individuals with disabilities find it difficult to receive critical information during disasters. This generalized approach jeopardises their safety and makes it difficult for them to take the necessary action during disasters. However, there is a positive move when it comes to communication using local languages.

"Exclusion of people with disability, some of the communication channels are not inclusive e.g. for people with deaf and dump- information is not inclusive", [DRO3].

"However, both NGOs and CPU try to bring people who are well versed in the language of the particular area. The radio system now has 10 to 12 languages so this inclusivity is very important. It's commendable",, [DRO4]. "Communication with everyone is not inclusive", [DRO11].

"Technology is also a barrier", [DRO11].

Communication infrastructure: Some areas may not have network connectivity and erratic power supply can hinder the timely exchange of information. During disasters such as cyclone IDAI for example, communication infrastructure was disrupted and this breakdown made it difficult for disaster response organisations to coordinate their efforts and affected communities to communicate and seek help as well as to ensure SA.

"The communication lifeline infrastructure may be very bad and I'm talking about roads, telephone systems, including transport itself. Some roads were still impassable years after Cyclone Ellen and Cyclone IDAI. I know some places that are still not reachable especially by car when it's raining", [DRO5].

Preparedness of various actors:

"But sources of information - the speed with which the information can be collected from communities or sites where disasters happen varies depending on the preparedness of various actors", [DRO1].

6.4.2.3 Reporting findings from community focus groups

The findings from this stratum revealed that in the event of a disaster, that may be people at the top possessing resources to assist the affected community, however, they may lack the current SA necessary for allow them to assist promptly and effectively. The information flow has some gaps. The fact that the DDC's office is often far away from the affected community also creates communication challenges.

6.4.2.4 Reporting findings from experts

The following two subthemes emerged from these findings: bureaucratic DCP structure and communication gaps.

Bureaucratic DCP structure:

"Bureaucracy is too much because you have to go to the Minister – Minister to Cabinet or even to the President. Currently, decision-making is long because of ministerial approval, it might take long or it might not be in the best interest of the DCP we require". [Expert_ DMA1].

"There is a bureaucratic procedure that must be followed for tents to be released by the Defence Ministry because there is a minister and at the same time there is a president, who is right at the helm and who is leading that organisation, he is the commander. So even the minister himself cannot bring soldiers on the ground before the commander says so. So the bureaucratic structures are a barrier", [Expert_DMA2].

Gaps in communication:

"When it comes to sharing the information, there are times when you find although DCP has the mandate, it does not have the data". [Expert_ DMA1].

"To me when you say you send a councilor to announce that there is going to be a drought, that's a very wrong platform according to me. Because the first thing when the audience looks at the person, they will say "oooh auya"... (He has come with that subject). So there is need for CPU to come up with neutral people who are called CPU people", [Expert DMA2].

6.4.2.5 Cross-case analysis

Diverse views were presented in this cross-case analysis with the convergence of NGOs and experts on the bureaucratic nature of the CP structure. This disparity results in lengthy communication times, hindering the effectiveness of disaster response. Overall, diverse views on challenges associated with disaster communication were presented by the different groups of respondents. The DCP acknowledged a weakness in the way disaster information was disseminated. They blamed a "one size fits all" approach which fails to account for people living in different geographical regions with different contextual factors that influence how disasterrelated information is understood and acted upon by different communities. Another challenge faced was the issue of community members sending false disaster information, as well as the exclusive communication strategies, i.e., not using communication methods accessible to the blind, such as Braille. On the other hand, the NGO group identified other subthemes, including the politics of information, gaps in communication and poor communication infrastructure. According to the community, the major issue that acted as a barrier to effective emergency response was the issue of distance between themselves and the DDC's office that undermined the swift communication relating to impending disasters. In addition to the issue of bureaucratic structure, the experts highlighted the issue of channels of communication. They expressed displeasure with the use of councillors conveying disaster information because of their affiliations. They also identified a gap in DCP and pointed out that sometimes the DCP lacks disaster data to share with responders. These identified challenges hinder the effectiveness of disaster response.

6.4.3 Low e-government uptake in Zimbabwe

In this context 'e-government uptake' refers to the degree to which the various government ministries adopt and utilise electronic government services and digital platforms.

6.4.3.1 Reporting findings from disaster response organisations (NGOs)

The findings from this stratum highlighted the importance of government line-ministries in providing valuable information required by response organisations for making prompt sound decisions during disaster response. Unfortunately, the websites of these government ministries do not contain sufficient information regarding possible or existing disasters to facilitate sound decision-making by response organisations. The current low e-government solution uptake by the various ministries responsible for disaster response contributes to the fragmented information silo that limits disaster information sharing. There is a lack of standardised processes for knowledge capture and sharing. As a result, it is currently difficult to leverage collective knowledge and resources. The possession of timely, current and up-to-date information by disaster response organisations is also a challenge. Even if the DCP plans to create a central repository of disaster information by bringing together all the different sources 'under one roof', some of these government line ministries websites do not provide sufficient information to allow stakeholders to make sound decisions.

"With government ministries at the central level, it's not always like you will find the detail at once. But we have to go down to the District like remember you want the number of schools in Chiredzi, you have to go down to the District level to get the information. It's supposed to be there at the national level but sometimes there might be some information gaps here and there and you need to go down to the district", [DRO1].

6.4.4 Lack of resources

In this context, 'lack of resources' refers to a shortage of or insufficient access to the critical material, financial, logistical, human and information assets required to effectively prepare for, respond to and recover from the disaster. A network diagram was created using ATLAS.ti.24 to visualise all the stakeholders that identified a lack of resources as a barrier to coordination. Figure 6. 6 below shows that multiple respondents highlighted a lack of resources as a major hindrance to effective disaster coordination in Zimbabwe. The ATLAS.ti.24 network diagram illustrates the pervasive nature of the resource constraint issue with the majority of participants highlighting it as a barrier.



Figure 6. 6 : Network diagram on lack of resources as a barrier to coordination

Source: ATLAS.ti.24

6.4.4.1 Reporting findings from the case organisation (DCP and CPC)

The DCP pointed out the major challenge of financing. The DCP lacks adequate funding to cater for all the disaster response needs. It emerged from the findings that securing timely and sufficient funding is a major challenge that is hampering the DCP's ability to respond effectively. The centralisation of the means of financing was found to be one of the major causes of this problem. The DCP echoed that the provincial heads have control of DRM within their province, however, they lack expertise in terms of fund-raising to execute the duties involved. When a disaster happens, they have to first request for resources at the national level and then a budget meeting is called to decide on the release of the funds required to provide the resources for the disaster response. These resources including communication devices (e.g. cellphones and airtime), evacuation centres, entities for ensuring mobility, infrastructure and capacity building as well as prepositioned resources. For example, technological infrastructure for early warning is one of the resources that the DCP lacks. Previous research findings have indicated the importance of EW systems in triggering the response effort. However, the efficacy of the EW depends on the accuracy and reliability of the underlying technologies or scientific methodologies employed in its generation. There is a gap in the current state of disaster prediction capabilities. This gap is starkly evident in cases in which the predictions made and announced to the public diverge significantly from the actual unfolding of the disastrous event. However, the DCP commended the great role played by the NGOs by providing resources complement government efforts. However, they expressed concern on over-relying on the NGOs because each has its specific way of operating.

"NGOs have been very helpful, but then, it's not something that we can count on and rely on because they have their way of doing things, and their objectives and purpose. Some have donated some resources for responding to disaster, but that will come with (in quotes) conditions. That equipment cannot be used in other areas except [in] the ones that they donated to", [Case Org CPC2].

Communication devices:

"They may not have the airtime, at the moment, these traditional leaders are using their own mobile devices but there is a government programme of buying smartphones for chiefs and headmen so they can communicate. We used to buy them airtime on a need basis kana pane zvaitika e.g. if a cyclone is coming kana kuti paine chaitika ... (if there is an incident not always) ...", [Case Org DCP].

Evacuation centres:

"When we communicate early warning for early action, the challenge is we do not have evacuation centres specifically for emergencies. Currently, we are using schools but the cabinet is not happy with this approach as they say it disturbs school pupils. , if it happens during learning or examination period", [Case Org DCP].

Mobility resources and infrastructure:

"Mobility at the district level is still a challenge in some areas they do not have resources to allow them to move around communities to do assessments". [Case Org DCP]. "Roadswhen it rains sometimes they are not trafficable and as a district we do not have enough vehicles when the disaster strikes", [Case Org DDC2].

"Infrastructure such as the road, communication, so sometimes accessing the area can be a challenge. You would know that community X has been affected but getting there can be a challenge", [Case Org DDC1]. "Network challenges – especially in marginalised areas – you can assume that people have seen and understood the message, yet they did not because of network challenges", [Case Org DCP].

"Connectivity is a challenge – internet facilities, data is still a challenge – people will be using data", [Case Org DCP].

"If you are in Chimanimani and the rainy season, some people do not have network coverage", [Case Org DDC2].

Prepositioned resources:

"Major one is the issue of resources, even if they are there they are not prepositioned, they are not on the ground. Whenever there is a disaster, we need to first of all call for resources to be availed, normally it takes time, because at the district level, there are no resources, it's actually centralised", [Case Org DDC1].

"The case for Cyclone IDAI, the national resources were very far away from the activity, so provincial resources were supposed to be the first to get, to address the issue". [Case Org CPC3].

Capacity building:

"I believe that resistance is a result of a lack of information. That is where knowledge comes into play, people need to be trained but they lack resources". [Expert DMA2].

6.4.4.2 Reporting findings from disaster response organisations (NGOs)

The findings from the NGO stratum revealed a general agreement that DCP is underfunded to address the pressing issues in DM and response. The DCP is underfunded and responders echoed that if does not received many resources from the national budget. The DDCs were commended for performing efficient, however, resources hamper their efforts. The respondents emphasised that the DCP might make very good plans, however implementing them was difficult. The lack of funding has negative implications on the DCP's ability to form and strengthen structures at ward and village levels, increasing the response time. It also affects their ability to capacitate the response teams and communities, develop ICT systems, such as a central repository of information to ensure effective coordination. The findings from the NGOs further indicated reveal that some parts of in Zimbabwe lack the network connectivity necessary for communicating disaster-related information. Communication networks and infrastructure are often severely disrupted or damaged and this fact makes it challenging for DCP to coordinate the response effort.

"They are not well-resourced to carry out their responsibilities and assignments". [DRO8]. The government is the first responder but then it cannot intervene directly, as it then starts calling for help afterwards", [DRO12].

Funding for strengthening structures:

"While the DA is supposed to be leading in providing resources for the formation of these structures, in most cases they do not have the resources, so they are supported by other partners", [DRO2].

Funding for capacity building:

"DCPC and WCPC are usually trained by NGOs and capacity building is done by NGOs in terms of skills and even equipment." [DRO5]. "The DCP lack resources to implement all their plans such as training people", [DRO7].

"So even if they want to train, it will be there as a plan on paper but with no resources", [DRO1].

"There might have the zeal to do so, but then the availability of the resources is the one that hinders the possibility of these trainings and cascading of information", [DRO12].

Communication devices:

"In terms of committee members reporting, it now depends on whether the chairperson has resources to report like a phone, or mobile connectivity", [DRO2].

"In some areas, the network is a challenge and some people do not have radios, cell phones or any other communication channels", DRO7].

Infrastructure and mobility:

"DCP's disaster response can be tricky because they lack resources such as helicopters, and transport to reach the affected areas. Sometimes when a disaster occurs, e.g. during Eline, bridges collapse and they are not able to reach the people on the other side of the bridge". [DRO7].

"For example, during cyclone IDAI, the road network was destroyed and there was a need for air transport, unfortunately, currently, the DCP is not equipped to service such kinds of disasters". [DRO11].

"Some areas are not accessible – there is no network coverage". [DRO3].

"The DDCs are doing very well, unfortunately, there are some districts where the DDC does not have a vehicle, and they have to depend on external support. In some cases, partners have to transport the DDC to assess the situation", [DRO12].

Technology:

".....Even in terms of weather stations, for example, you would get one serving the whole district. We rely on generalised information", [DRO2].

6.4.4.3 Reporting findings from community focus groups

The findings from the community focus groups highlighted the need for phones to allow the quick transfer of information to the headman. Currently, these VH do not have phones allocated to them by the CP, they use their own and it is a problem for those who without personal phones. The recommendation is that the VHs should be allocated phones and be on WhatsApp groups through which messages concerning the whole district are transmitted, all VHs will know what has happened in their communities through WhatsApp messages then be able to follow the correct procedure. They also indicated a lack of prepositioned material at community level as a barrier to effective disaster response and recommended the need for a minimum threshold. They recommended reviving or supporting 'Zunde raMambo' (a Shona method of growing and storing grain for use during the time when food supplies are low) to allow communities to assist themselves first before responders arrive.

6.4.4.4 Reporting findings from experts

The findings from experts pointed to the fact that in this climate controlled era, disaster can come anytime and, thus, the DCP always should be ready for any eventuality. Unfortunately, the DCP is under-funded and experiences a staff shortage. It uses pooled resources and capabilities, a procedure that reduces the effectiveness of the disaster response effort because it is not possible to rush the various ministries to agree to release the required resources. The experts recommend that the DCP as a disaster coordinating organ should have a supply of non-perishable materials, such as tents, rather than solely relying on pooled resources.

"In the current scenario, you are told you have been given that much but they have to request resources whenever a disaster happens. So the Treasury has to mobilise resources and respond to any emergency", [Expert_ DMA1].

"CPU on its own is not a well-resourced entity that has got all the machinery that is needed. They depend on other entities whenever there is a disaster such as a cyclone", [Expert_DMA2].

6.4.4.5 Cross-case analysis

There is general agreement in the cross-case analysis that funding is a major barrier to effective disaster response in Zimbabwe. All four groups concurred that the DCP is underfunded and receives limited funding from the central government. They rely on external funding to implement most of their activities. However the responder groups differed on the issue of the resources that affect the effectiveness of disaster response with each group looking at resources that require funding that have a major impact on their own operations. The DCP highlighted the issue of communication devices such as phones and airtime for the community leaders, evacuation centres and vehicles at the district level to ensure DDC mobility, as well as infrastructure in general, including transportation, communication and utilities. In addition, they also identified the issue of prepositioned material. The NGO group, however, identified a lack of resources to strengthen structures at the ward level, communication devices and infrastructure. The community group identified the lack of communication devices such as phones and airtime and also a derth of prepositioned material at the village level. The experts highlighted the issue of prepositioned material and staff shortages. The different groups all converged on three different issues namely: communication devices, infrastructure and prepositioned material. However, in terms of prepositioned material, the DCP recommended prepositioning at ward level while the community recommended prepositioning at the village level.

6.4.5 Culture

In this context, culture refers to the shared beliefs, values, behaviours and attitudes that shape the disaster coordinating organ's overall decision-making and operational approach. Key aspects of culture include the leadership's ability to foster collaboration and empowerment, to acknowledge and learn from past mistakes, to prioritise rapid response, proactiveness and preparedness (priorities), the extent to which DCP promotes transparent free flow of information and the extent to which it is oriented towards the community.

6.4.5.1 Reporting findings from the case organisation (DCP and CPC)

The NGO also expressed concern over the DCP's culture of overreliance on external sources for funding, citing it as a potential barrier to effective disaster response. They indicated that this overreliance culture may limit the DCP's decision-making autonomy and internal capabilities. It was highlighted that these partners have their purpose and goals and, as such, sometimes the DCP is forced to 'dance' according to the direction of the partners. This over reliance on partners

also leads to a lack of control by the DCP. Another major concern of the over-reliance culture was the issue of sustainability because, in the event of partners also not being well resourced or not formerly structured and maintained, the DCP's disaster response capability is jeopardised. The NGOs also identified the issue of politics within communities. The sources of disaster information at the community level include community leaders. These individuals may sometimes emphasise aligning the communication to their agenda rather than objective facts and needs of disaster response. They may also use disaster messages as an opportunity for political pointscoring. Community dynamics and politics often take over and political differences within a community are solved using disaster communication. The NGOs also highlighted a culture of competing or internal conflict among the disaster response organisations and partners as a barrier to effective disaster response. They highlighted cases in which partners, especially those that perceive themselves as better resourced than the others, compete for control and recognition, leading to a fragmented approach. This competitive culture results in barriers to information sharing among the responding organisations, resulting in a breakdown in information sharing. The partners blamed this competing culture on the unavailability of SOPs guiding how these responding organisations should work together in a unified manner.

They also highlighted the reactive nature of DCP as a barrier to disaster response.

Overreliance on partners:

"So you would find you will end up wanting to rely on donors who would come in with their way of doing things and conditions", [Case Org CPC2].

"When a disaster happens UN Agencies are the ones that come and document working together with the government and then for you to get the information done by the UN agencies, you struggle. Sharing the findings it's a challenge", [Case Org DDC2].

Culture of political expediency:

"We rely on community leaders and other stakeholders for information on people affected. People might want to settle their differences", [Case Org DDC1].

Competing culture:

"Competing instead of collaborating. Partners do not have a guiding document that guide them on how to behave, those with more resources want to be more visible", [Case Org DDC1].

"Conflicts within the players in identifying priorities. Some offices, politicians would want mileage instead of looking at global issues and how best to address them", [Case Org CPC3].

"Then you will not have 'vamwe vakutoti isu tine zvinhu vedu' (we are well resourced) so, this is what has happened, we are going to do it our way, and we are not going to report to anybody", [Case Org CPC2].

6.4.5.2 Reporting findings from disaster response organisations (NGOs)

There are also elements of a lack of accountability and commitment to evidence-based decisionmaking and also corrupt practices. Some cultural norms and values are affecting disaster response in some parts of Zimbabwe. For example, in some cultures, responders fail to heed the DCP's call to relocate to safer places as they believe they cannot leave the graves of their loved ones alone. Some places are also sacred and, as such, it is important for disaster response organisations to understand the various beliefs that shape the communities. The DCP exhibits a culture of reactiveness rather than proactiveness. The DCP consistently responds to disasters in an ad-hoc manner, i.e., to immediate crises as they arise and this results in a slow response to disasters and some inefficiencies in response efforts. In some cases, resources are mobilised after a disaster has happened. In disasters of higher magnitude, the ability of DCP to respond is questionable. However, efforts are underway to compile National Disaster Risk Management Plans.

The findings from this stratum revealed that the DCP is a government department that works according to a protocol and that it is difficult to separate politics from a government department. As a result, some people who do not know how to navigate the political spaces find it difficult to work with the DCP. The government was blamed for delaying the declaration of disasters and, as such, the DDCs are sometimes influenced by political nuances. However, the NGOs commented that the DDCs individually are effective but the issue of politics sometimes compromises their decision-making. This practice then affects the effectiveness of disaster response, making it difficult for those people who do not know how to navigate the political space. The findings also revealed that the multisector approach to DM in Zimbabwe, for example the Ministry of Health works with the municipal health departments in which the decision makers are usually from different political affiliations. Instead of attending to disaster issues objectively, sometimes politics take centre stage according to the agenda of these political figures, introducing distractions and, thereby, creating coordination challenges that hinder effective disaster response.

Culture of political expediency:

"The DDC somehow they are prompt, but the challenge now is it becomes political", [DRO6].

"So, it's not always easy to deal with the department if you don't know how to navigate the political space", [DRO1].

"Have lesser political bottlenecks. Instead of issues being attended to very quickly, first political debates and derailments of the agenda happen before, finally, after a very long while, some amicable decisions are done but after a certain number of people have suffered. So I think we would need a neutral start and a politically neutral channel for such decisions to be taken without endangering the lives of people", [DRO12].

The study findings revealed a culture characterised by a lack of accountability in scenarios in which aid passes through the DCP pool. In such incidents some articles have expired in the warehouse because the warehouse manager failed to provide responders with the keys to access the aid and distribute it to needy communities. The findings also revealed incidents in which DDC officials requested bribes for assessing community projects. The NGOs highlighted that these issues hamper coordination and erode public trust in the response organ.

Lack of accountability resulting in thriving of corrupt practices:

"if you want to take them out to the field, to assess or inspect projects that assist the community, they need US\$20 for every visit that they make, just to take them outside their office", [DRO8].

Some cultural norms and values in affected communities:

"Most communities are reluctant to relocate from the areas where they live regardless of the area's vulnerability to natural disasters. They believe that they cannot abandon the final resting places of their ancestors in favour of moving to a new and safer location", [DRO7].

"Some areas are sacred especially in Chimanimani where cyclone IDAI struck. There is a need for all stakeholder engagement specifically chiefs and headmen to take you through the affected communities", [DRO9].

Insular culture:

The findings from this stratum revealed that the DCP sometimes deliberately leaves out some key stakeholders during important meetings. This action makes disaster coordination ineffective since disaster response is everyone's responsibility. There is limited voice and representation of women

to disaster response issues. This gap affects women's participation in and access to disaster information and resources.

"In some cases, the private sector is left out. I am not sure what the reasons are within government for leaving out the private sector. Where are research institutions"? [DRO2]. "Women are excluded from certain roles and men are normally nominated to represent communities perpetuating the patriarchal system in societies", [DRO3].

Overdependence on partners:

"They rely on partners for almost everything", [DRO3].

"For the things that are in their mandate to happen, they depend on someone else", [DRO1].

"So if we don't have development partners funding it, we rarely have government coming in to fund that plan", [DRO2].

"So there is over-dependence on NGOs or donor support in terms of implementing these DRR activities", [DRO5].

"We also need to be self-reliant. There was a time when miners who were declared trapped in some mine. Imagine, they had to go and get canine from South Africa to come and sniff out here! It means all the dogs in Zimbabwe can't find people?", [DRO12].

"There is also limited admin funds from most NGOs, So in case of the government reaching out to NGOs as well which is the culture – you might find out that loopholes in which you cannot respond fast enough", [DRO5].

"The issue of resources, it usually doesn't have a standing budget. It's only called into when a disaster has struck then they start now to mobilise resources. With the little resources, they start now to appeal to the partners around, who are working in a particular area that has been affected by the disaster", [DRO4].

A reactive culture, lack of trust and public confidence:

The findings from the NGOs revealed that the DCP is reactive to disaster response as shown by its tendency to look for aid after a disaster has struck instead of having a threshold in place for any eventuality. According to the NGO responders, the lack of urgency in declaring and responding to disaster has negatively affected the effectiveness of disaster response in Zimbabwe. These findings also revealed that there is a lack of trust between the government and the emergency response organisations especially with regard to resource mobilisation and distribution. The government prefers a system of bringing the aid to a common pool and then distributing to the affected communities. However, NGOs prefer distributing to beneficiaries on their own for fear of different targeting criteria. In some cases, the government, because of

suspicion issues, holds meetings and just passes resolutions without the involvement of the NGOs. The NGO sector will then be told to take what will be available on the ground.

"The DCP has a reactive culture rather than a proactive approach. Currently, there are no structured processes for capturing and documenting disaster knowledge and disseminating it amongst responders", [DRO4].

"Generally they are relaxed, they are not aggressive, and they need to be proactive and ready for any eventuality", [DRO4].

"They will start to mobilise resources once a disaster has struck", [DRO12].

"We know of the DCP when there is a problem that would have happened that requires their intervention otherwise they remain inconspicuous and largely quiet. We would expect a more active engagement from them, devising proactive measures even before a disaster strikes", [DRO8].

"There is always an issue around suspicion - some say bring everything to a common pool, then we distribute it, others say we want to distribute ourselves, because it may end up in wrong hands", [DRO2].

"And there are times (because of suspicion issues) there are meetings that are done and then you are just told this is what we want. If you want to respond you respond according to what is there", [DRO2].

"Sceptical – the fear that the information can be a threat to national security hence fear of knowledge sharing", [DRO4].

Knowledge hoarding:

"Various ministries will lead depending on their strength. However, in some instances, you would find that ministries or organisations depend on certain individuals. For example, the Ministry of Health can have a strength or capacity because of a certain individual within the ministry. If that person is not there then everything is upside down. There's a challenge there that needs to be addressed", [DRO6].

Competing culture:

"In other cases, you would find response organisations fighting to assist the affected community", [DRO4].

6.4.5.3 Reporting findings from community focus groups

The findings from the community focus groups revealed the issue of accountability regarding the distribution process. They recommended that leadership should make follow-ups to ensure that aid reaches the intended beneficiaries.

"Depending on the leadership, in some cases aid is hijacked, the affected communities fail to receive the aid. The leadership should ensure that the aid gets to the affected or intended recipients", [Community Focus Group 3].

6.4.5.4 Reporting findings from experts

The community focus groups identified a culture of self-delusion as a barrier to effective disaster response in Zimbabwe. In some instances, the government is unwilling or is not able to critically examine its decisions, actions and performance impartially and objectively. Instead of ensuring accountability by reporting correctly, the government makes excuses and self-justifications, 'cherry-pick' data to validate their actions and, in some cases, exhibit a mindset of complacency and fail to acknowledge their weaknesses and vulnerabilities. Failure to report accurate results regarding gaps in interventions only weakens the DCP's disaster response capability. In the long run, this culture erodes the community's confidence in the DCP's competences and leads to the community not heeding the DCP's calls instructing communities to act. The experts also identified a culture of political expediency as a barrier to effective disaster response. This fact has been exhibited mainly through the implementation of Education 5.0's community engagement pillar in which universities can be used or can be partnered with for researching innovative ways to resolve problems affecting vulnerable communities. However, currently, it has not been easy for the universities to enter the said communities, in some cases some researches are considered political agents. So actions and decision-making are primarily driven by political considerations at the expense of the long-term welfare of the communities. This failure to easily and quickly incorporate the diverse perspectives and expertise of academia undermines the DCP's ability to respond effectively to disasters.

The study findings also revealed that currently there is so much emphasis on response and little emphasis on preparedness and anticipatory action. The DCP is reactive rather than proactive.

Culture of self-delusion:

"We need to move away from the ideology of erroneously assuming that we are in a position to manage disasters properly. We need to accept the reality. Where we are a failure, we accept that we are failing", [Expert- DMA2].

"Genuine and honestness is one of the most important issues because if we lie to ourselves in terms of disaster, we are only increasing our vulnerability, so honest and trust with review and reporting is critical", [Expert_ KME2].

"Next time when they send out another message, people will not trust them and will not listen to them", [Expert_ KME1].

Culture of political expediency:

"The starting point, which makes life difficult for universities is, if you want to get into a community, the procedure to be permitted to work in a community to come to the grassroots is very difficult because most of the time it will be associated with politics", [Expert DMA2].

Reactive culture:

"Instead of waiting until the disaster strikes then you start to mobilise the resources, there is a need to have or press much emphasis on proactive" [Expert DMA1].

6.4.5.5 Cross-case analysis

The majority of the respondents across all four different groups highlighted that the DCP is reactive. They do not focus on proactive measures in disaster response and management. The NGO group, the experts and the DCP all identified a culture of political expediency in which politics takes centre stage. There is also convergence in the findings of the DCP and NGOs, they both indicated the overreliance of DCP on partners. The NGOs and the community groups identified a lack of accountability as a barrier to effective disaster response. In contrast, each of the respondent groups had their potential barriers with DCP highlighting a lack of community orientation, a competing culture and lack of SOPs. While the NGO group pointed out cultural norms and values of affected communities and an insular culture. Lastly, the expert group added a culture of self-delusion. All these barriers affect the effectiveness of DCP's ability to respond to disaster.

6.4.6 Poor disaster knowledge management

In this context, poor disaster knowledge management refers to DCP's inability to effectively capture, store, share and utilise disaster knowledge and the lessons learned from previous disaster experiences. This situation can hinder the DCP's preparedness and response capabilities.

6.4.6.1 Reporting findings from the case organisation (DCP and CPC)

The findings from the DCP revealed that disaster information is scattered across the different disaster response organisations and there is no central disaster repository from which a holistic view of disaster information can be accessed. This siloed approach to disaster knowledge presents barriers to effective disaster response. The findings from the DCP revealed that as a nation, Zimbabwe lacks a system for documenting and preserving institutional knowledge. This failure has resulted in critical knowledge being stored in the minds of individuals. If the individuals die or leave the country, this constitutes the permanent loss of institutional knowledge. Findings from CPC members who responded to cyclone IDAI reveal that while responding to Idai, some affected residents highlighted that a similar incident has happened in the 1940s. It is however not clear whether this information is correct because it was not documented and there are not sufficient people who witnessed the incident in the 1940s to confirm the incident. In addition, there is a lack of systematic documentation and storage of disaster information making it difficult for people to access information relating to previous emergencies. The findings also revealed the lack of a standardised approach to disaster response. No centralised training is offered to people who respond to disasters so that they can act in a unified manner during the disaster. Currently, each member responds based on personal understanding and their respective department's way of handling such 'situations. This lack of a standardised approach can be a source of conflict or delayed actions that compromises the effectiveness of disaster response.

Siloed information:

"...but having a one-stop shop for disaster information that we can share with the public might be a bottleneck- there is a need to integrate the various sources of information", [Case Org DDC2].

"The issues of fragmented coordination, there is a lot of individualism by departments whenever such things happen, where some other departments would be doing their own thing", [Case Org CPC2].

Undocumented knowledge culture:

"The issue of writing is the weakest point for Africans. Documenting lessons learned", [Case Org CPC3].

Competing culture:

"Competing instead of complementing each other. Sometimes development partners want to come and be more visible like the other. Partners do not have a guiding document that guides them on how to behave, those with more resources want to be more visible", [Case Org DDC1].

"Everyone wants to show prominence or identified to have done this and that. At the end of the day, even the coordinating body becomes like side-lined", [Case Org CPC2].

Lack of standardised approach to DM:

"We don't have like, a central skills training institution for those people who have a role to play in DM and response. So, everyone else can do it but doing it in their own pockets individually, it will still make it difficult to coordinate. So at the end of the day, people begin very good things to assist, but these things are not speaking to one thing as a nation. So that has been quite a problem". [Case Org CPC2].

"An enabling legislation is very key, and in its absence, it's a serious hindrance. Departments come in there under the banner of their own legislation. When they go there they have their own Policy Act, which tells them what to do. It may not even be in line with what we want to achieve in terms of disaster response" [Case Org CPC2].

6.4.6.2 Reporting findings from disaster response organisations (NGOs)

In terms of disaster knowledge capture, the findings from the NGOs revealed that the DCP relies heavily on data collected by other agencies such as the NGOs. In warehouse management, the DCP lacks a structured approach to capture and document all the relief material that arrives at its warehouses. This situation leads to inaccurate and incomplete records of relief material in the warehouse. Related to this, the DCP also lacks a structured approach to managing community needs data, there is no structured approach to collecting and organising information about the specific needs of communities during a disaster. This situation makes it difficult for response organisations to prioritise distribution and, thus, ensure equitable access to resources by the communities.

"With the relief material at a central warehouse, you would find that some places were not given the relief due to a lack of a centralised point of information convergence where information about the specific community needs is captured and shared", [DRO4].

"If you are in one cluster and not in the other, you may not get the information you need about the other cluster. For example, the food security and education clusters, they might be information that is required in both clusters. For example, you want to do a school feeding program- it's a food security issue but it affects the education sector as well. To avoid a siloed approach using the clusters", [DRO1]. In terms of disaster knowledge storage, the DCP does not keep disaster information at a central place. The study findings revealed that there is fragmentation of information and relevant disaster information is strewn across different platforms. This situation makes it challenging for response organisations to access consolidated critical information leading to delays and inefficiencies in disaster response. This absence of a centralised disaster knowledge-sharing mechanism results in inefficient resource allocation, duplication of efforts as well as gaps in addressing critical community needs. There is also a gap because each cluster manages its information and intercluster communication becomes a challenge. A lack of this historical information makes learning from past disasters difficult. The findings indicated that disaster information and knowledge sharing is currently taking place through the use of physical meetings, WhatsApp groups and emails. These findings revealed that disaster information sharing among responders is not mandatory, except for certain reports required by the DDC. Currently, responders find it difficult to find the type of information that they need to make sound decisions during disasters. They struggle to acquire the information from the various sources. It also emerged that communities lack disaster awareness and this hinders effective disaster response. The DCP does not offer training to both the responders and the communities to prepare them to respond effectively to disasters.

"Know that sharing is only restricted to mandatory reports. You would find that honestly, people will be following you to say ..." my friend, do you know, or do you have information about this. there is no public database that can be accessed by everyone", [DRO5].

The findings also revealed that AARs are conducted after incidents and lessons learnt from previous disasters are sometimes documented and, in some cases, contain important details. However, they are not shared amongst the responders and other stakeholders.

Policies:

"Policies – organisations have different policies and some organisations do not comply different organisations do not comply due maybe to ignorance", [DRO11].

6.4.6.3 Reporting findings from experts

Findings from experts reiterate the point that Zimbabwe uses a multisector approach. As such, disaster-related information is housed with different organisations. There is a lack of a central disaster knowledge repository from which responders and other stakeholders can access information. As a result, some responders struggle to find the information they need promptly and

this negatively affects the effectiveness of their response effort. The findings also revealed that some sectors have not documented and/or stored disaster data for future reference when needed. There is a considerable untapped knowledge within communities.

"I actually realized that there are people in localised communities, who are well resourced in terms of knowledge, especially when we talk about folk/ local /indigenous or citizen knowledge, whichever way you want to call it. I realised that the knowledge is not being tapped and made use of", [Expert DMA2].

"In Zimbabwe knowledge is scattered all over and its usually treated as something for universities. People don't believe that KM is there in business, it's there in disaster, chinongonzi knowledge chikoro chete (knowledge is associated with the education sector only) and it's not something that can be applied in the business sector which is a misnomer", [Expert KME2].

6.4.6.5 Cross-case analysis

The findings indicated general agreement across all groups of responders with the majority of responders in each category highlighting that the DCP lacks a central disaster knowledge repository. They echoed that disaster information is scattered across the various sectors. It is difficult for emergency responders to promptly access the information they require. There was also a general agreement across the sectors relating to disaster information gathering and capturing. The DCP lacks a structured approach to disaster information acquisition. They lack historical information and, as such, documenting and preserving institutional knowledge becomes a challenge. It is also difficult to learn from past mistakes or lessons learned during previous disasters. In addition to the common factors across the groups, the DCP identified a culture of competition among responders as opposed to collaboration, a gap in policies and a lack of standardised approach whereby partners do as they wish regarding disaster response. While the NGOs added over-reliance on partners and a gap in policies. They also highlighted that AARs are completed after emergency incidents, however, there are questions about their documentation and sharing of lessons learned.

6.5 KM strategies for coordination and collaboration among emergency responders

6.5.1 Creating a single repository for disaster information

6.5.1.1 Reporting findings from the case organisation (DCP and CPC)

The CPC category recommends that the DCP should develop a centralised disaster knowledge repository. This repository should constitute a comprehensive collection of disaster information that responders and other key stakeholders require in order to make sound decisions. The types of information identified by the responders include historical data on past disasters, IK about the area, a robust EW, expert knowledge, district profiles and vulnerability assessment for the area.

6.5.1.2 Reporting findings from disaster response organisations (NGOs)

The findings from the NGOs revealed that the DCP should invest in a disaster repository database that keeps track of disaster information at national, provincial, district and ward level. The findings suggested that disaster information should be collected at ward level and stored in a central repository managed at the district or ward level. This repository should gather information about anticipated disasters, past disasters and lessons learned from them, a list of people who should be contacted in the event of a disaster, a list of evacuation centres and information about each district and the risks to which each district is prone. This information will allow for a more localised and granular understanding of disasters at a local level, including the specific impact on the various community groups, the response efforts, the indigenous EW systems and indigenous knowledge for that ward. This stratum recommended this approach because it allows for understanding and recording of vulnerabilities that affect the said ward and facilitates a more proactive approach to DM and response. This localised data enables emergency responders to make context-specific and targeted decisions that ultimately improve the effectiveness of disaster response. According to the NGOs' respondents, gathering indigenous knowledge facilitates community engagement and improves the overall effectiveness of disaster response because the community, who happens to be the first to help themselves before external assistance arrives, can learn more about disaster response. Their involvement is key to the success of disaster response. Collecting disaster data over time also allows for the conducting of trend analysis at the district level to identify recurring patterns in disaster events. This procedure will help the community develop localised mitigation measures, EWS and preparedness plans. In addition, this centralised repository should allow for knowledge sharing and utilisation by all stakeholders who need it.

"Creating a single repository of information where whatever piece you might find elsewhere, you also find it in that central location, so that everybody has got like a onestop shop for all the information to a particular humanitarian emergency", [DRO1].

"We need a centralised platform for collecting and disseminating information", [DRO4]. "The repository is very vital, as people just log in and send their information to report an emergency", [DRO3].

"Because if they are at the ward level, people would be able to compute a trend analysis based on the information of past disasters. It will then help us determine the frequency with which we are experiencing disasters", [DRO2].

"Weather information in Zimbabwe is usually generalised across a district, so if it's generalised across a district, what does this mean for a village which is on the other side?? So we are looking at the ward disaster response teams being able to input and say whilst you are talking of having rains maybe in Harare in the next 24 hours, but here in Budiriro we have had rains for the past 24 hours", [DRO2].

6.5.1.3 Reporting findings from experts

The findings from expert interviews provided the recommendation that to address the challenge of siloed disaster information, the DCP should develop a centralised repository in which disaster information should be housed. Currently, the DCP relies on information gathered by partners, and the partners have control over the data collected. The centralised repository will allow the DCP to oversee the data. By using the multisectoral approach, the DCP can be a 'one-stop shop', gathering disaster information from all the stakeholders and storing it in the central repository to ensure that all those that need the information will access it at 'a single click of a button'. This repository should be a compilation of data from different organisations, including government agencies, UN partners and agencies, NGOs and all other the stakeholders. Stakeholders will not need to move from one office or ministry to another looking for information, all the required data will be available within the national disaster repository. Unfortunately the DCP currently has a building for the 'one-stop' emergency centre. The repository should contain lessons learned from previous disasters. These findings suggest that the DCP should ensure that after every disaster, AAR is conducted and lessons learnt are identified and documented. The DCP should facilitate research during which in-depth interviews with affected communities are conducted as well as with those parties who played a critical role during the disaster response. All the processes must be documented, including first-hand information from the local communities as well as the impact of the disaster on the populace. Instead of just working on the team report after the disaster, it is also key to document what the communities report in terms of what transpired during and after the disaster. This process will help in gaining an in-depth understanding of their perspectives, experience and insights. These documents will help future researchers and generations. Thus, the DCP should initiate research areas and work with all involved parties. They should facilitate brainstorming sessions and workshops to gather the disaster data. These AARs should also act as feedback loops that feed into the knowledge repository.

"..because the knowledge repository requires those reviews, how did we do it?, how were we successful, where did we fail, why did we fail, genuine and honestness is one of the most important issues because if we lie to ourselves in terms of disaster, we are only increasing our vulnerability, so honest and trust with review and reporting is critical". [Expert_ KME2].

The disaster lessons learned housed in the repository should be incorporated into academic curricula, training programmes and professional development opportunities. Experts suggest that instead of working with artificial case studies at the primary, secondary or tertiary level education, actual disaster cases should be embedded as cases when it comes to DM. Examples must come from actual disasters that occurred in Zimbabwe. Thus, the DCP should work with the Ministry of Education to compile study material that incorporates these actual case studies from Zimbabwean communities instead of referring to a cyclone in Haiti or South Africa. The respondents highlight that it is acceptable to refer to other disasters that occurred in other countries for comparative analysis purposes but it is important to include case studies relating to disasters that occurred in Zimbabwe. It will then be possible to compare Zimbabwe's disaster response efforts to those of other countries to identify areas of improvement and best practices.

6.5.1.4 Cross-case analysis

There is convergence in views across all response categories because all groups appreciated the significance of a central disaster knowledge repository.

6.5.2 Investment in indigenous knowledge-based EW systems

6.5.2.1 Reporting findings from the case organisation (DCP and CPC)

"And this EW also should take into consideration indigenous knowledge". [Case Org CPC3].

6.5.2.2 Reporting findings from disaster response organisations (NGOs)

The findings from the NGO stratum suggested that the DCP invest in facilitating the development of EWS, encouraging local communities to integrate indigenous knowledge in this project. The EWS should take into account the unique local context of the community or area, including the ecological, geographical and social factors that influence disaster risk and has been time-tested and adapted to the local conditions. The respondents recommended that the DCP, through the local authorities, can keep an indigenous knowledge database of the most recurring disasters in that area that would foster intergenerational learning and knowledge sharing and, hence, improve resilience within communities.

"There is a need for community engagement on how to come up with home-grown EWS. Let's incorporate IK based EWS by making use of locally available resources using local knowledge that we understand and then we can just borrow a few things from outside", [DRO3].

"The response has to start with EWSs. Are there EWS in place? If they are there, are they at the local level? Are they using IKMS? Because IKS should be able to feed into EWS", [DRO2].

6.5.2.3 Reporting findings from community focus groups

The findings from the community groups revealed that within the same district, each ward can record its unique local indigenous knowledge that can be integrated into the EWS. The findings from the focus groups highlighted certain signs that the community in Ward X used to identify that the rains were coming. These included certain types of ants moving up and down roads in a straight line, the sighing of specific types of birds, a form of wind coming from a certain direction and the noise coming from a nearby waterfall. The community focus groups highlighted the need to follow tradition to preserve nature and reduce the impact of disasters. However, they indicated that the signs do not warn them of the intensity of expected rain, they merely show them that rain is anticipated. The respondents highlighted that the indigenous knowledge resides as tacit knowledge and holders of this tacit include VH, the headman and the elderly residents in the communities. They suggest that the young generation should listen to the elderly residents to

acquire knowledge about the communities in which they reside. Some places are also considered sacred, and people are not allowed to talk carelessly about them or use metal utensils such as cups for drinking water at springs. The headman have their rituals (*chivanhu*) that they perform to ensure that their areas are protected from harm.

6.5.2.4 Reporting findings from experts

"In addition to these scientific and technological, integrating with IK will also help because sometimes these communities have been there for years and people have been relying on these indigenous data to understand or predict disaster so understanding how these can be integrated is also essential,." [Expert_ KME1].

6.5.2.5 Cross-case analysis

There was general agreement across all groups of respondents that EWS should be the trigger for any action and that there is a need for integrating IK into the EW. The NGO group emphasised the need for DCP to ensure that data about the IK for most recurring disasters is collected from each village and housed in the knowledge repository. On the other hand, the community group reiterated that it is possible that within the same district, each ward or even in some cases each village can have its own unique IK that can be integrated to the EWS. It, therefore, is important that this knowledge is gathered and stored in a repository as a means of preserving this knowledge.

6.5.3 Capacity Building

In this context, capacity building refers to DCP's efforts to develop and strengthen the skills, knowledge, resources and capabilities of organisations, individuals and communities to prepare them to respond to and/or recover from disasters.

6.5.3.1 Reporting findings from the case organisation (DCP and CPC)

For the community:

"To avoid false information ... So I think it's more on the education and awareness of our populace to be conscious of the repercussion and ensuring that whenever they give this information, it will be truthful", [Case Org CPC2].

"In terms of community dynamics, we need training at the village level. We need to capacitate the villages", [Case Org DDC1].

For the responders:

"To avoid fragmented coordination, If we can have some central training, that is coordinated by the CPU, where the ACT is actually educated to those bodies involved, then everyone appreciates that, then you will not have vamwe vakutoti is tine zvinhu zvedu (we are well resourced) so, we are going to do it our way and we are not going to report to anybody", [Case Org CPC2].

6.5.3.2 Reporting findings from disaster response organisations (NGOs)

Findings from this group point towards prioritising capacity building initiatives for the local communities, disaster response organisations and all other stakeholders involved in disaster response. Capacity-building programmes should focus on enhancing skills and knowledge related to disaster response and for the community this can also include disaster data collection and reporting to allow for timely collection and reporting of disaster data. Capacity Building in DM for all ministries that respond to disaster should be implemented.

"....I suggest for us to address this coordination problem, let us use the local systems and people who already reside in that community. These people know the geographical map of the affected area. Those locals should be capacitated in case the disaster recurs. They should know how to respond, the community should be equipped", [DRO4].

"Are all response mechanisms in place building on local efforts? Because in an area we are responding, the affected will not be passive recipients. Are we doing something to ensure that we build on local efforts for sustainability?". [DRO2].

"This climate change implies that anything can happen anytime, therefore, the communities and responders should be co-sensitised on what to do in the event of an eventuality". [DRO8].

"At times, lack of knowledge can lead to a worsening of the hazard or a disaster because you don't know the proper procedure to report when there is a disaster", [DRO12].

6.5.3.3 Reporting findings from community focus groups

The community groups recommended that the government should facilitate some training with the elderly in communities that include 2-year-olds and all the other age groups. This training should focus on unearthing the history of the community, identifying important places and why these should be respected. They highlighted the fact that some younger generation (people born after the year 2000) do not respect the traditions and historical practices of the communities. This situation is affecting the resilience of communities. Some trees that have been preserved for years have been cut down by the youth. Consequently, village assemblies should be held to bring awareness of traditions and taboos. The elderly should educate the younger generations on the importance of preserving the village areas and explain how this practice was implemented in the past. This knowledge should then be disseminated to everyone and community member should be made responsible for passing this knowledge from generation to generation. The community groups stated that the VH and headman should continuously educate their communities, but pointed out that the people do not always listen them or value the knowledge they possess. If the VH tells them not to cut down trees, some people will not listen. It is only when outsiders, such as EMA representatives, say exactly the same thing that people will comply.

"We should have people coming from the national, then as VH, we will then participate and tell the community. The government should come in to support this effort. If EMA comes, etc. Madzisabhuku anebassa (VH has the duty) to ensure preserving the communities and reduce the risks and vulnerabilities in the communities. The government should then come and assist in that regard." [Community Focus group 5],

Due to climate change, it is important for people and communities to be conscientised regarding the need to respond quickly to disasters. They should be educated regarding disasters and risk management and know what to do, where to go and how to act in order to assist themselves before responders arrive. People affected by a disaster need food and this is the reason why Zunde raMambo should be revived to ensure that communities have reserves of food and other supplies in the event of a disaster. The chief should also be involved in helping the community in before the externals arrive.

6.5.3.4 Reporting findings from experts

The findings from experts emphasised the need for capacity building in terms of disaster risk management to commence at the highest level such as with the critical leadership, specifically

the Members of Parliament. These politicians have the power to tell communities what to do. The experts pointed out that the ideal scenario would be for each Member of Parliament to understand the disaster risk scenarios that exist in their constituencies. The capacitation of politicians could be undertaken through workshopping and seminars. Once they have gained the necessary knowledge, it will be very easy for them to share this information with grassroots communities. Members of the Zimbabwe's top leadership should understand the vulnerabilities that befall the constituencies that they represent and this knowledge can impel them to become proactive in addressing these weaknesses. According to the experts, the MPs should leverage on Zimbabwe's Education 5.0's community engagement pillar, through which universities are mandated to work with communities in addressing challenges affecting them or in tapping into the opportunities they face. Under this pillar, the MPs should alert universities regarding the disaster risk scenarios or vulnerabilities that exist within their constituencies that need innovative solutions.

"Have awareness programmes at different levels even integrating this in education because it's a strong system in terms of channeling information and also getting the younger generation to appreciate the issue of disaster as they grow", [Expert_KME1].

"It's our mandate as a university to say zero disaster occurrence in this particular region or province, so the more we work with those people, the more we reduce the challenge /disaster", [Expert DMA2].

"We would make it mandatory to political leaders to attend crucial conferences if COP meetings. Educate those at the helm of administration first as opposed to the vice versa situation. We spend a lot of resources educating grassroots communities yet these are not a problem because there are certain people that they look up to", [Expert_DMA2].

6.5.3.5 Cross-case analysis

There was consensus across all groups of respondents that the DCP should embark on building the capacities of the stakeholders. The CPC members recommended training of the communities as well as the responders. The training programmes for the communities should address issues relating to the conveying of false information as well as general awareness on what to do and where to go in the event of a disaster. The responders should be conscientious of the Zimbabwean Civil Protection Act (2001) and engage in workshops during which the various sections of this Act can be unpacked and debated, together with the SOPs, to avoid fragmented coordination. This practice will result in a unified approach to disaster response and foster a culture of collaboration rather than competition among the responders. In addition to suggestions

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made by the CPC members, the NGOs recommended that training on disaster data collection should be offered to selected members of the community. They also suggested that since the DCP uses a multisector approach, there is a need to train the members of the various ministries who work with the DCP on how to respond in the event of a disaster. In support of capacity building, the community groups emphasised the need for training at the community level to preserve indigenous knowledge within that community. They emphasised that this younger generation does not respect the traditions of their communities and, consequently, their actions are contributing to some of the disasters Zimbabweans are facing. Training is needed to conscientise them regarding the history of the community in which they are living, as well as its sacred places and why it is important to preserve that knowledge for future generations. Members of the expert group, however, recommended a different approach and stated that it is important to start training the top leadership, i.e., the MPs, who will then cascade the information to their constituencies. The experts also emphasised the need to incorporate disaster into academia through the introduction of real cases that affect Zimbabwe as case studies in educational courses.

6.5.4 Use of Technologies

The use of technology in managing disaster data, information and knowledge has been identified as a key step towards improved emergency and crisis response in Zimbabwe. An overview of the findings using a word cloud in Figure 6. 7 below highlights the multifaceted role of technology in supporting disaster knowledge management practices. Valuable insights were revealed in this study and these include:

- The need for proper data management using technology: This is evidenced by the prominence of words such as data, information, centralised, databases, repository, cloud, warehouse, lake and systems. All these point to the need for a DCP with robust data management capabilities.
- The need for the deployment of collaborative communication platforms as evidenced by terms such as collaborative. This finding suggests a strong emphasis on technologies to facilitate collaboration and information sharing among emergency responders.
- The need for the adoption of advanced data analytics and data visualisation techniques to support evidence-based decisions. This fact is shown by words such as visualisation, mining, trends and analytics.

• The need for sound mechanisms for data collection using various tools and techniques such as the adoption of mobile applications for community-level data collection. This fact is evidenced by the existence of terms such as Apps, collecting, IoT and remote sensing.



Figure 6.7: Word cloud: use of technology in disaster knowledge management

Source: ATLAS.ti.24

6.5.4.1 Reporting findings from the case organisation (DCP and CPC)

Due to the major importance of the EW in disaster response and considering the current state of the technologies for predicting EW, the CPC members recommended that the DCP invest in reliable technologies that will accurately predict disasters.

6.5.4.2 Reporting findings from disaster response organisations (NGOs)

The findings from the NGOs revealed that the DCP can leverage technology for disaster knowledge capture, storage, processing and sharing. The DCP can use a variety of tools such as drones, and IoT sensors to capture information that, together with the data collected by various responders, can be integrated into a central repository that all responders and stakeholders can access when they need to make data-driven decisions. In addition, ML and AI can be used to analyse historical data and patterns to predict future disaster scenarios and this knowledge will enable DCP to become proactive in disaster response. For disaster knowledge storage, the DCP

can utilise repositories and cloud-based platforms that will facilitate knowledge sharing and coordination. Other technologies for data storage highlighted by participants included GIS for flood mapping, development of a service provider database, data collection application and information and network infrastructure :

"We need GIS for flood mapping in disaster response. GIS should help us identify areas that are prone to flooding or areas that have been affected by floods. It should help us to be proactive by identifying vulnerable communities and planning accordingly", [DRO4]. "The DCP should develop a service provider database which contains all service providers, both government and NGOS. The database should contain information about all the NGOs operating in an area and the areas that they cover, so that when other responders from other areas come, they already know the NGOs on the ground. This helps in avoiding repetition of tasks and effort", [DRO4].

"There should be a national database of first responders and resourced people, institution and companies. We also need a 911, an integrated services to say when you call, the call centre is linked to police, ambulance, the psychological service or so forth", [DRO12].

"We need an App to be used by people on the ground to put information about the prevailing situation on the ground. This will also help when other responders from say Harare, Mutare, Chipinge etc., when they come they will see the current situation and what the other responders would have covered and the gap. This will help them avoid situations where one relief item is over or under subscribed", [DRO4].

"We would also want an information and network infrastructure, GSM phones that can work in any network terrain, low network for ward-based extension officers of the different ministries, then the DDC can receive information very fast". [DRO12].

Development of an inter-cluster home

Findings from the NGOs highlighted that the current cluster approach to disaster coordination is a commendable mechanism for crisis response, especially within each cluster, however, there are information gaps with regard to inter-cluster information sharing. To address this siloed approach, there is a need for the development of an inter-cluster home that ensures that everyone knows what issues the other cluster will be focusing on so as to improve disaster information sharing and hence coordination.

"If you are in one cluster and not in the other, you may not get the information you need about the other cluster. For example, you want to do a school feeding program- it's a food security issue but it affects the education sector as well. To avoid a siloed approach using

the clusters, creating an interagency- inter cluster platform coordinated by the DCP, where leads from each of the clusters come together becomes a solution. That would make the sharing of information much better", [DRO1].

6.5.4.3 Reporting findings from experts

The findings from the experts recommended that the DCP can enhance its ability to create, share and utilise disaster knowledge effectively by integrating various technologies across the knowledge management cycle. Technologies can effectively be used for knowledge creation and capture, knowledge storage, processing and analysis, as well as for knowledge sharing and distribution. However, in selecting these technologies, the DCP should be clear on the challenges that the department is currently facing concerning the management of disaster knowledge. The DCP should also be clear on its KM objectives. Thus, the technologies to be selected should be in line with DCP's specific KM objectives and the challenges it needs to address.

6.5.4.4 Cross-case analysis

The findings across all the groups of respondents recommended that the DCP should invest in technologies that would assist in DM and response. The CPC members emphasised the use of technologies for EW that will improve the reliability and accuracy of the disaster predictions for triggering response efforts. The NGOs and experts stressed the need technologies that help in gathering, storing, processing and sharing disaster data. They also highlighted the need to invest in a centralised repository that would ensure that both disaster knowledge cluster information could be accessed from a central point. The experts also recommended that in order for DCP to benefit from the technologies, it first needed to understand the KM challenges that it is facing and the technologies that should be adopted to address their KM objectives.

6.5.5 Engaging in partnerships for KM

A broad overview of the role of partnerships as a strategy for disaster KM for improving emergency and crisis response was given, using a network diagram as shown in Figure 6. 8 below. The network shows the key themes that emerged concerning partnerships from the analysis of all interview transcripts. These include the need for cross-sector collaboration. This fact is supported by multiple quotations; of interest are partnerships with academic institutions, other government agencies and communities to leverage their diverse expertise, as well as other organisations for resources and funding.



Figure 6.8: Network diagram on partnerships for KM

Source: ATLAS.ti.24

6.5.5.1 Reporting findings from the case organisation (DCP and CPC)

The findings revealed that the DCP should consider partnering with universities. The DCP should tap the Zimbabwe's education 5.0 system that allows universities to partner with communities. Through the MPs responsible for particular districts the DCP should facilitate these partnerships and ensure that rapid assessments on the vulnerability of each area are conducted by the

universities and then documented and stored in the centralised repository. This practice will provide the DCP with profiles for each area at a minimum cost. In addition to rapid assessment, academia should also research innovative ways for dealing with disasters within the local communities and investigate how the communities can cope with the hazards caused by such events. Academia can also participate in data gathering during and after disasters, such as conducting AARs for generating reports on lessons learned that should be stored in the central knowledge repository.

"The academic sector can handle rapid assessments. For example, chimanimani is a mountaneous area vulnerable to heavy rains. We can compare chimanimani with its mirror image, countries like Japan with same contexts of high rainfall and winds. We can't be talking of having to relocate people every time. Why not make people live within their hazards that is informed by research? To say, if you are going to construct a house in this area, this is the type of house that is sustainable for people living on this particular area", [Case Org DDC2].

"When a disaster happens UN Agencies are the ones that come and document working together with the government and then for you to get the information done by the UN agencies, you struggle. Sharing the findings it's a challenge. Our own universities should do the lessons learnt", [Case Org DDC2].

6.5.5.2 Reporting findings from disaster response organisations (NGOs)

The findings revealed that the DCP can partner with tertiary institutions, private companies and embassies to share expertise and knowledge and, thus, leverage this collective knowledge to improve crisis coordination. One important area of collaboration is capacity building through the training of emergency response organisations and the affected communities. Partnerships in this regard can facilitate the transfer of knowledge from one organisation to another and all parties can benefit from each other's knowledge, experience and best practices. By fostering a culture of collaboration, the DCP can facilitate shared learning that will lead to innovative disaster response solutions. This process will also allow organisations to focus on the same aspects, e.g., education, and pool their resources.

"DCP should partner with colleges, universities and even embassies to offer DRR training", [DRO4].

"We need a very good resource mobilisation mechanism to be in place, so that we have resources on standby so that we can actually respond in time. So if the DDC could have a good network of all district ministries and partners, as well as good financial backing", [DRO12].

"When we talk of disaster, we should understand that all of us are affected, it is everyone's responsibility without looking at where you are coming from and I think we have an equal role to play. DCP should partner with all including private sector and academia", [DRO2]. "Instead of relying on one source, which will be the government source, there are other independent researchers or institutions who are working in these areas to triangulate the findings. It would be good to work with other organisations that collect data in this particular aspect", [Expert_ KME1].

6.5.5.3 Reporting findings from experts

The experts commended the government on the issue of partnership. They highlighted that the government has been actively seeking partnerships and gave an example of the construction of the Emergency Centre that was built by Higher Life, which is a private company. They also commended the private sector for its role in the construction of roads in some of the communities affected by floods and cyclones. One expert indicated that the DCP has also partnered with academia. While another stated that this type of partnership is not being implemented. The respondent highlighted that although the university libraries contain valuable research studies, the DCP is not taking advantage of such knowledge to improve their disaster preparedness. It was further recommended that the DCP should partner with the Ministry of Primary and Secondary Education.

"It's also partnering with e.g., academia/universities that are part of the DCP", [Expert_DMA1].

"There are so many projects in the library, so much has been done in the area of research but the connection between the universities and CPU is a missing link. It costs less to do that. To simply say, whatever you have in terms of the risk situation in Muzarabani, let's collaborate so that we know what has happened in the past and what is likely to happen. Collaboration could be there on paper but not effectively being implemented", [Expert_ DMA2].

"My argument is that if the MP starts by linking up with universities, then it will be very easy for the DCCs to accept universities to do some research with the local communities", [Expert DMA2].

"So having awareness programs at different levels even integrating this in education because it's a strong system in terms of channelling information and also getting the younger generation appreciate the issue of disaster as they grow. They know that there are disasters that are likely to happen", [Expert_ KME1].

The findings from the experts also made recommendations from the perspective of global geopolitics. The experts emphasised the need for all parties to put aside tensions, ideological differences or political factors that may override humanitarian concerns. They stressed that effective disaster response requires cross-border coordination and collaboration among nations and, as such, suggested that nations put aside geopolitical rivalries for sharing critical disaster-related data. The experts recommended a 'win-win' type of partnership as opposed to a scenario in which only side benefits.

"Another angle to be considered especially from a global perspective is global geopolitics. We need to bear in mind that disaster knows no boundary. For example, if a volcano erupts, it knows no boundary, what it simply does is magma follows a gradient. It doesn't say this is the Mexican border therefore the magma stops there. So we should go to a time where we say, we need to put politics aside and focus on disaster and follow mitigation propositions so that we save lives." [DMA2]. "International liaison- every disaster situation has been or is being experienced by other countries. So, if we have that kind of international collaboration, it is critical", [Expert_ DMA2].

"...if that problem is towards the South African border, we collaborate as well with the South African DM establishments, if its towards Mozambique, we collaborate with neighbouring country, knowing what they can offer us, with a click of a button", [Expert_DMA1].

"Internationalization, so, that framework must include resources endowment and the best way to do that is to collaborate with already rich countries so in the event of a challenge or even before we talk of a challenge, we are talking of building resilience – as a nation so that we are able to save lives", [Expert_DMA2].

The experts also recommended strengthening inter-ministerial coordination between and among government ministries and agencies to ensure effective sharing of information for disaster preparedness and response.

"When we are talking about the Ministry of Agriculture, whatever planning needs to be done in the Min of Agriculture has to involve other ministries. Because we cannot talk about farming without considering EMA regulations", [DMA2].

6.5.5.4 Cross-case analysis

The findings from the cross-case analysis revealed a consensus that the DCP should have partnerships that enhance its ability to manage knowledge. The CPC members recommended partnerships with universities for research and data collection while NGOs recommended collaborating with academia in general including both the Ministry of Higher and Tertiary Education and the Ministry of Primary and Secondary Education, as well as the private sector and embassies. They recommended areas of collaborating for and responding to disasters. Some experts reported that the government has started partnering with both the private sector and academia. They mentioned the emergency centre that has been constructed by a private company. However, another expert stated that the implementation of collaboration with academia is weak for both the higher and tertiary education and the primary and secondary education. The experts also recommended partnering from the perspective of global geopolitics and encouraged countries to put aside differences for the good of humanitarian work, as well as strengthening inter-ministerial coordination.

6.5.6 Governance policies and legislation

6.5.6.1 Reporting findings from the case organisation (DCP and CPC)

The findings from the CPC members revealed that the current CP Act (enacted during the 1980s) is no longer fit for purpose because it is outdated and ill-equipped to deal with modern-day crises. The CPC members recommended the review of the current CP Act, specifically the passing of this Bill into law. This shortcoming has resulted in responders acting haphazardly in an uncoordinated manner

"There is need to review our CP Act. Disasters that used to be there in the 80s are now a bit different. E.g., we now have artisanal miners who are poisoning the water bodies and that means we need to take a different approach, when you have a disaster of this nature, this is how you are supposed to react". [Case Org DDC2].

"The DCP should strengthen its framework of coordinating by coming with an instrument that coerces CPC members, to take this serious", [Case Org CPC2].

6.5.6.2 Reporting findings from disaster response organisations (NGOs)

The findings revealed that the DCP can develop policies to address the challenge of commitment to DM. Respondents noted with great concern that the level of commitment that people put into disaster response is not as high as that given by soldiers when doing their work. To cultivate a culture of commitment, consistence and a positive disaster work environment, the DCP can develop policies that address the issue of commitment. The participants also recommended that policies be put in place to address DCP's bureaucratic decision-making strategies that will streamline this process and allow the DDC to mobilise the necessary resources at district level.

"If you look at the way soldiers work, they can die for the country, but if you look at other government department workers, commitment is like optional. We should have such commitment in disaster response and management. The person should be charged for not being there to serve the most vulnerable person. A policy should be put in place in this regard", [DRO6].

"So if only there was a policy in which collective district resources and authorisation can be put in place then we can have swifter responses. Because if everyone has to talk to their national offices and then information has to cascade back that eats into a lot of time. The DDC oversees others- but those structures also have their central command", [DRO12].

6.5.6.3 Reporting findings from experts

The experts recommended that for DCP to become more effective, certain policies and instruments need to be in place. These include revising the current CP Act to enhance the role of local authorities, limit the political powers of certain individuals, when a disaster should be declared and also create a KM policy, a Data Protection policy and a DM Response policy.

"What I find missing within the NCPC is the participation of local authorities. You would find that their voice is minimal, yet they are the first responders when disaster happens. It goes to the principal Act, the legislation governing disasters which is silent on the role of the local authority. There are efforts to revise the act. My understanding is that the role of the local authority should be enshrined in the ACT", [Expert_DMA1].

"Revise the current Act because as long as the principal legislation and the policy guide the DCP operation, we can't go anywhere with the current Act. Make an overhaul on the Act and then take on board other issues. Overhauling of the instrument without legal backing it will be difficult", [Expert_DMA1].

"The government should be quick in announcing disaster, so revision of policies so that people won't wait", [Expert_ KME1].

"Data Protection Act, Knowledge Management policy", [Expert_ KME2].

Limiting political powers

"Policies that have to do with human rights and environmental rights are areas that need to be protected. So when it comes to these, we would want a scenario where we are saying no one is above the law. But the very first that needs to be adjusted is the political policy and then we can talk of other aspects like global ideologies". [Expert_DMA2].

6.5.6.4 Cross-case analysis

There was a general convergence of perspective and all responder groups recommended the revising of the current CP Act because it is outdated and does not synchronise with 21st century challenges. The CPC members recommended a clause that coerces the CPC members' participate in DM response. The NGO group likewise indicated a lack of seriousness and commitment by response organisations and recommended an instrument that mandates their operation. They also suggest the introduction of SOPs to allow the DDC to mobilise resources at local level in the event of a disaster to ensure a swift response rather than waiting for the arrival of national or provincial resources. The experts, however, recommended revising the CP Act to explicitly state the role of local authorities in disaster response and their participation in NCPC, as well as directing the government to declare disasters timeously.

6.5.7 Fostering a knowledge culture

In this context, a knowledge culture refers to a culture characterised by the willingness of all stakeholders to participate collaboratively to ensure the exchange of ideas, effective integration of technology for managing knowledge, as well as the establishment of organisational policies and structures that support knowledge generation, sharing and utilisation.

6.5.7.1 Reporting findings from the case organisation (DCP and CPC)

Effective communication: The CPC members recommended that the local leadership should be equipped with phones to allow them to communicate effectively. To ensure the accuracy, reliability and trustworthiness of the information the public shares with the DDC, the CPC members recommended strengthening this practice at local level by having informants at the village level who assess and validate any reports given to the DDC. These individuals should also be equipped with communication devices.

"The DCP must encourage the exchange and dissemination of information. For swift and effective communication, local leadership, who are the sources of information should be equipped with gadgets such as phones. For weather forecasting, MSD should continue to open up bases across the districts to allow for more granular predictions", [Case Org CPC2].

"As the CPU committee, we must strengthen our sources within given areas, who can quickly verify, if we get information that, on such such a place, such a thing happened. We must be able to have, these informants or link persons that are found in these particular areas, to be able to verify", [Case Org CPC2].

Collaborative culture: The CPC members recommended that the DCP should facilitate continuous engagement among partners in the same cluster to avoid their competing instead of collaborating. This practice will successfully combine resources for prepositioning.

"The partners should collaborate rather than compete", [Case Org DDC1].

A proactive culture: The CPC members acknowledged that a third world country cannot create static resources for a disaster that may not occur because this practice can disadvantage other areas. They, however, recommended having a minimum level of preparation amongst all stakeholders, as well as having equipment in a serviceable state. The CPC members also recommended identifying evacuation centres well in advance rather than reacting after a disaster has struck.

"We are advocating for prepositioning at village /community level like schools, local clinics should have emergency kits such as provisions of tents, shelter food items for communities that are vulnerable to disasters", [Case Org DDC1].

"For as long as certain threshold, are kept at provincial and district level, we should be able to get to the point when other resources are being mobilised to deal with the occurrence," [Case Org CPC3].

"We wish a scenario where if we communication, the community should take action but there is nowhere to go- no evacuation centres", [Case Org DCP].

Restructuring DCPs for KM: The CPC members recommended that for the effective gathering and dissemination of information, the DCPs should restructure their current strategies to facilitate the free flow of information. They should be on the ground with the grassroots people gathering information. *"It's proper that the DCP be decentralised, they should have their officers, solely responsible for CP issues at provincial and at district, reporting to its directorate", [Case Org DDC1].*

"The ideal is to have CP personnel solely responsible for CP issues at the provincial and district level, unfortunately, the budget for wages is the hindrance", [Case Org DCP]. "I think within the Act, there is supposed to be a person designated for CP at the provincial level and the district level", [Case Org DDC2].

SoPs: The CPC members recommended formulating SOPs that explicitly state who leads the disaster after a disaster of magnitude X has struck. There should also be a way of coercing people to take the CP issues seriously.

"We have recommended that when EW is accurate, it must tell us the magnitude, and this must direct a certain ministry to lead. So that even in the SOPs, it's clear that for such a magnitude of a disaster we expect Ministry X to lead. If it's normal then the convectional structures should lead", [Case Org CPC3].

"There should be an instrument to ensure that people take the CP meetings seriously as currently attendance seems optional", [Case Org CPC2].

6.5.7.2 Reporting findings from disaster response organisations (NGOs)

Effective communication: The NGO group recommended that the DDC should have a comprehensive understanding of the local context – they should understand the indigenous knowledge and vulnerabilities within each ward and other significant factors that apply to a particular context. They recommended contextualised communication that is integrated with local expertise and supports two-way communication. The NGO group argued that with this recommended approach will enable responders to promptly provide targeted interventions. Communication should also be frequent and comprise language that everyone understands i.e., local languages to ensure no one fails to receive important messages. The DCP should also make physical visits to ensure everyone receives disaster response information

"In remote areas where dissemination of information is very difficult, DCP staff should physically move to these remote areas and educate them. Most times these less privileged people are caught unaware", [DRO7].

"Communication should be in the local language to ensure that people understand", [DRO8].

"To ensure the capturing of all issues from the communities, the DA's office should put desk-friendly units in communities which should act as information centres, they should act as reporting systems and the DCP should get reports through these information centre", [DRO8].

A collaborative culture: The study's findings reveal that the DCP should foster a collaborative culture and highlighted the need for including everyone in disaster response because disasters know no boundaries. As such there is a need for effective information sharing and collaboration among the diverse groups of emergency responders. Recommendations given to cultivate a collaborative culture include the development of a central repository of information that addresses the siloed-thinking problem that will promotes a mindset of collective problem-solving. Training and capacity building for the CPC members at national, provincial, district, ward and village levels to help foster collaboration. For inclusivity, the local community should be empowered as equal partners in disaster response.

A proactive culture:

"The DCP should adopt a proactive culture rather than a reactive culture: It should have contingency plans in place. Not to start running around when a disaster occurs. They should also offer training to bring awareness to the communities and ensure that they are ready to attend in the event of a disaster". [DRO7].

"The DDC's office should be well-resourced. As NGOs- we rely on donor funds and thus we sometimes might not have the resources to be proactive. If the DA has an allocation for proactive measures, this would help improve DM;, [DRO8].

"The DCP requires a proactive charismatic leadership. They should write proposals to embassies and also liaise with partners like UNDP and others for dormant funds that they should fall back on in the event that a disaster strikes", [DRO4].

"Proper planning enhanced by the DCP itself", [DRO3].

"So if the DDC can have a good stock that is always on standby so that they don't have to be mobilised after every disaster which takes time and so forth", [DRO12].

6.5.7.3 Reporting findings from community focus groups

Proactive culture: The community focus groups recommended that the government/partners should support the communities efforts to revive Zunde raMambo. They should provide water pumps and/or sources of water etc. This process will allow communities assist themselves.

"As a community, if the Zunde raMambo can be revived, Munda wacho wezunde, mvura yacho iuye, (if we can have water sources dedicated for Zunde) so that if a disaster happens, the community will at least assist itself even before externals come", [Community Focus Group 3].

Restructuring for KM: In each village, risk management teams should be formed at the ward level. They should have their own WhatsApp group to ensure awareness, and campaigns alerting people on the risks or vulnerabilities facing them. These teams should work closely with the VH and headman to assist in DM. This process will ensure that everyone is alerted and remains vigilante. This committee should comprise community stakeholders such as VH, Zinatha and Agritex. The fact that DDC's office is a long distance from the affected communities also creates communication challenges, thus, the community focus groups recommend the setting up of sub-offices that cater for wards. Each sub-office can cater for two or three wards depending on the number and size of wards in a particular district. These sub-offices should be manned by DCPs solely responsible for DM, who have a comprehensive understanding of the wards they represent and are equipped with bicycles to allow them to travel to the wards to conduct assessments and verify reports. The DCOs should be linked to the community radio through which to provide localised information to the VH for transmission to community members who do not have radios, in order to ensure a more rapid response to disasters.

"The DA's office should have a sub-office at ward level, with DCP people who are well knowledgeable of the vulnerabilities in the area. Say two or three wards. This will make follow-up and reporting easy and it's easier to move the information because they know the area", [Community Focus Group 5].

6.5.7.4 Reporting findings from experts

Restructuring for KM: The findings suggest that there should be a DCP representative at district level who are soley responsible for CP issues as opposed to having committee members who are already overburdened with other duties. They also suggested having DCP as a stand-alone unit as opposed to being a department within the MLGPWH. They recommended adding a Chief Knowledge Officer (CKO) to the organogram as part of the strategic team.

"To have a well-constituted unit at the district level -people solely responsible for CP matters at provincial and district and even ward levels. Rather than having someone who has their work somewhere and has CP work as secondary. They don't have enough time to research more and to raise awareness", [Expert_ KME1]. "Separate the DCP from the Ministry and empower it to make some critical decisions on preparedness and response. Currently, decision-making is long because of ministerial approval, it might take long or it might not be in the best interest of the DCP we require", [Expert_DMA1].

"Also there is that need to begin to understand that you need a KM expert at the strategic level like a CKO instead of a CIO, to be part of the strategic team", [Expert_KME2].

In addition to adding dedicated individuals at the provincial and the district level, the experts recommended extending the structure to the ward and village level and having DCP officers at the ward level to ensure a swift and accurate flow of information. Another recommended option is for the DCP to create a network of informers at the grassroots level who should assist with information. They will be on the ground collecting the data, rather than the DCP solely relying on partners for disaster data. These people will then report appropriately to the district level. This practice will also address the problem of depending on ward councillors (who are consider political) to communicate disaster information to their constituencies. To ensure data quality and integrity, the experts recommended that the DCP should make use of diverse sources of data collection rather than relying on one source that could be faulty. This process will help in triangulating the information that comes into the system.

"We do not want a situation where the Ministry has to depend on literature repositories. We want a DCP that goes down to the grassroots level to gather information", [Expert_ DMA2].

"Let DCP be on the ground to gather information. Let it have its database that it builds right from the bottom. They are using the wrong sources of information", [Expert_DMA1]. "The DCP should build a strong network from the grassroots where they have contact persons. That chain where there is that flow of communication", [Expert_ KME1]. "Because the moment we talk about a ward councillor reporting what is happening in a ward, we are already roping in the political perspective. We are considering someone who has specifically designated office and we try to bring that person into the realm of DM which is very different", [Expert_ DMA2].

The experts also recommended setting up the EOC at the ward level to cater for microscale climatic conditions that are very difficult to understand if one views them from a distance. These EOCs should have robust data management capabilities. They should house a comprehensive repository of disaster-related information comprising data on the ward's hazard profiles, assessments of vulnerabilities, response resources, responders, available resources and past

incident reports for that ward among. The collected information should be used to identify patterns and trends and, thus, inform proactive approaches to disaster response and management within each ward as opposed to district level predictions to cater for microclimatic conditions. Predictive modelling can then be used to anticipate the disaster's potential impact and proactive measures taken.

"It's very difficult to picture or to understand micro-level occurrences such as heat waves. People might talk of a heatwave from a micro perspective and someone who is about 50km away in the same district experiencing rain conditions may not understand or may misunderstand that and yet it's possible", [Expert_ DMA2].

"We want to be able to say, that the flood disaster is in Tsholotho, then we plot the high areas in Tholotsho online. Then we say, mostly history has told us that water levels will rise to about 10 meters, so which areas are above 10 meters, we advise communities to say those close to this point move to this point". [Expert_KME2].

Proactive culture: The findings from the experts recommended that Zimbabwe's government integrates disaster risk considerations into the planning processes of all the various government agencies and ministries. They should do this by introducing disaster planners whose main duties include the identification of potential hazards and vulnerabilities. They should act as subject-matter experts in their ministries, providing insights to inform resource allocation, policy decisions and contingency measures. This disaster-conscious planning approach will enable a more anticipatory approach to DM.

"From a DRM perspective, the rule is "assume something is going to go wrong" and therefore "Be ready". That's what we call a proactive approach to DM." That is where we should move and get to, drawing from the lessons, and events from the past.", [Expert_ DMA2].

"We talk of mining at the moment – it's a very flourishing sector where people are making a lot of money out of gold and mercury. They are putting health issues aside e.g., the use of mercury is causing a lot of harm to the people and the environment. A disasterconscious planner is going to help in focusing on possible risks likely to be encountered not only about that ministry but other sister ministries", [Expert_DMA2].

"... from a disaster-conscious planning perspective, we weigh the benefits and the losses that we are likely to encounter not only concerning that particular ministry but also how it affects sister ministries and we awaken other ministries and try to work together to deal with such challenges", [Expert_DMA2].

SOPs:

"SOPs for experts or support for communities on what to do in the event of a disaster that's maybe in a language that most understand not English. What is the procedures? If we can have such for different people including those LWD so that people will be aware", [Expert_ KME1].

Community-based disaster knowledge capture:

"Culture change first where we want to inculcate a culture of recording issues, a culture of managing knowledge", [Expert_KME2].

"... have a network of community members who are knowledgeable of IK gather data from them regularly so that knowledge is tapped from those people. They would give you sort of a trend of such disasters in that particular community. Where they would tell you, No, this is not new, we have experienced drought situations come year x, we had it year Y, we had it year T. So, such people are very critical", [Expert DMA2].

6.5.7.5 Cross-case analysis

This category of responders recommended fostering a knowledge culture through putting measures in place that encourage effective communication, such as giving local leaders communication devices and having informants at the village level. They also recommended fostering a collaborative culture by encouraging continuous engagement among partners. Another suggestion is for DCP to be proactive by having a minimum threshold of prepositioned material at the local level as well as identifying and communicating evacuation centres to the communities. They also recommended that the DCP should restructure for KM, by having people solely responsible for CP issues who will handle information gathering and sharing issues. Lastly, they recommended having SOPs that explicitly state who takes the lead, depending on the magnitude of the disaster. The NGO focus groups recommended that the DCP should communicate effectively. This practice could be achieved by its acquiring a deep understanding of the profiles of the villages within each ward and the wards within a district. They should also understand the IK within these areas. They recommended the use of local languages as well as the development of a knowledge repository to facilitate a shared understanding and effective knowledge sharing. The NGO focus groups also suggested that the DCP should be proactive and store a specified minimum threshold of prepositioned material.

The expert group recommended that DCP should restructure for KM through recruiting dedicated individuals and setting up EOCs. Two options were suggested, the first being to hire individuals who are solely responsible for DM at ward level, while the second option recognised the cost

implications and suggested the creation of a network of informers within each ward who could act as information sources. This practice will help to address the problem of the DCP over-]relying on partners for information as well as using political sources, such as councilors. They also suggested setting up of EOC at ward level to cater for micro-climatic conditions. The second recommendation focused on fostering a proactive culture through a disaster conscious planning approach. They also recommended developing SOPs and community-based disaster knowledge capturing.

6.6 Summary of findings

6.6.1 From the ANT analytical lens

DCP involves a diverse set of human and non-human actors. The human actants include DCP personnel, first responders, volunteers, logistics and supply chain specialists, government agencies, non-governmental organisations, community-based organisations and private sector partners. These actors are interconnected mainly through resource allocation and information sharing and their relationships with non-human actants include communication and information systems, physical infrastructure such as transport networks, utility systems (water, telecommunication and electricity) as well as knowledge resources, such as SOPs and guidelines. In the event of a disaster, the human actors form a dynamic network. Most actors belong to different clusters/sectors but share the same goal and constantly interact. The ability of actors to join the network is influenced by the time it takes for DDC to process MoUs (a non-human actant). The ability of the DCP/DDC to mobilise actors to align their objectives is also influenced by the availability and enforcement of SOPs by the DCP/DDC. The findings revealed that power dynamics play a significant role because some large well-funded organisations behave independently within the network, thus, negatively affecting the effectiveness of DCP/DDC's coordination efforts. The DCP is not well-funded, it relies heavily on external partners for resources. This dependency may influence its ability to effectively coordinate emergency response. The findings also revealed a competing culture among responding organisations that disrupts the coordination efforts.

Recommendations

 For effective coordination, there is a need to strengthen the following non-human actants: Physical infrastructure: by setting up EOCs' disaster response facilities (evacuation centres and distribution warehouses). • **Knowledge Resources:** by developing knowledge repositories containing data on past disasters and lessons learned, training materials and educational resources.

The DCP should streamline its processes to ensure the timely signing of MoUs as actors join the network. The DCP should also strengthen the enforcement of SOPs to ensure a smooth coordinated process. The DCP needs strong leadership who can address the challenge of power dynamics. Funding should be mobilised to ensure that the DCP becomes self-reliant and avoids over-dependence on external partners.

6.6.2 From the structuration theory analytical lens

DCP operates within the CP structure that governs the coordination and execution of emergency and disaster response in Zimbabwe. This structure establishes the formal hierarchies that guide DCP's decision-making processes. Actors are expected to follow the CP structures that guide the unit's coordination abilities. Responders follow a formalised structure in communicating disaster, information flow is two-way and sometimes the process becomes bureaucratic, hindering the effective exchange of information during a disaster. The findings revealed that the DCP is underfunded and this fact constrains its ability to respond effectively to disaster. DCP is also embedded in a reactive culture, lacks accountability and is characterised by competition among responders. The DCP lacks strong leadership oversight, follow-up and feedback mechanisms to ensure members fulfil their responsibilities. Actors feel they are not accountable for the timely completion of the task assigned to them or not attending CPC meetings.

The following mechanisms are currently being adopted by the DCP for coordinating disasters in Zimbabwe: CP structure, disaster information flow, disaster KM, interagency coordination committees, capacity building, ICS, MoUs, SOPs, disaster debriefing and KS. All these activities are influenced differently by the broader political, social and organisational structures. For example, the CP structure is typically shaped by the regulatory and legislative framework and political systems in Zimbabwe. The centralised structure negatively affects DCP's crisis coordination ability. Despite the importance of SOPs in guiding day-to-day operations, the findings are not clear regarding whether the DCP has SOPs in place or enforces the SOPs. The MoUs are also shaped by the political landscape in Zimbabwe. Thus, it is important to note that there are some issues that the DCP itself does not control. The way the DCP works is partly shaped by the political and social factors in Zimbabwe as well as its organisational factors. For example,

information flow relies heavily on the communication protocols, IT infrastructure and KMS in place. Currently, the DCP's lack of IT infrastructure adversely impacts its ability to effectively respond to disaster.

For actors to make sense of their responsibilities, roles and the overall coordination process, they draw upon established protocols, however, the enforcement of these protocols is questionable within DCP. The findings revealed that some responders were unaware of the existence of SOPs. They also indicated that there is a standardised reporting format that responders should use when reporting to the DDC because it facilitates a shared understanding. The findings revealed that the DCP is reactive, a process that does not align perfectly with its mandate to be proactive and accountable. This situation is influenced by DCP's social and cultural norms as well as the broader regulatory, legal and organisational frameworks.

6.6.3 From the 7S model analytical lens

Strategy: The study findings indicated that DCP's coordination strategy demonstrates a poor level of responsiveness to evolving coordination needs. The DCP is weak at capturing and documenting lessons learned from past disaster events. As a result, this deficiency hinders the ability of DCP to quickly adapt to swiftly to changing disaster scenarios.

Structure: One of the key strengths of the CP structure in Zimbabwe is the clearly defined roles and responsibilities and their impact on coordination. This structure shows that the current reporting and decision-making hierarchy is centralised. This process makes information flow easy and enhances accountability. However, the findings revealed some shortfalls in the current structure. The employment of personnel who are solely responsible for CP exists only at DCP's national level. The DCP is understaffed and is supported by NCPC that is multisectoral comprising representatives from various sectors. At provincial and district levels there are no staff solely responsible for CP. However, the DCP is represented by the PCPC at the provincial level and the DCPC at the district level. Organisations focusing on a particular area are grouped according to clusters and the study findings revealed siloed thinking that lacks of cross-sector KS, thus, hindering seamless KS. The structure is also accused of bureaucracy. Some organisations at the national level might not be represented at provincial and district levels. DCP structure is heavily centralised with key decisions and resource allocation being controlled at the national level. This

acts as barrier to effective coordination and collaboration. There are also no relevant structures at the ward and village level. The findings revealed a gap in the composition of CPC, individuals are drawn from government line ministries and other response organisations and this constitution presents challenges in terms of commitment. The DDC's office is located far away from where emergency incidents occur, thus, assessment becomes a challenge, leading to long response times.

Systems: In terms of governance and compliance systems, respondents identified a lack of clear roles and responsibilities, especially when specialised ministries take over disaster coordination. There are no mechanisms for ensuring accountability and oversight and, thus, responders behave according to their own agendas. The findings indicated that Zimbabwe has several sound policies in place, however, their enforcement is lacking. In relation to KMS, this study identified the DCPs' the lack of digital tools and platforms for enabling real-time collection, analysis and dissemination of disaster information as a major weaknesses. There is a lack of communication infrastructure and a robust KMS. The DCP lacks a centralised knowledge repository that provides access to all emergency responders seeking disaster information. It also lacks a website. Although disaster information is spread across various departments it is not integrated, hampering DCP's ability to exchange critical information in a seamless and timely manner. The findings revealed that DCP carries out AAR, however, its implementation is questionable and sometimes not documented. Concern was also raised about the application of lessons learned. There were mixed views on the ability of DCP to offer capacity-building programmes. The findings revealed that the DCP does not offer training due to limited funding while the DCP indicated that they offer training under the banner of hazard experts. In terms of coordination protocols and procedures, the findings revealed mixed views on the availability and enforcement of SOPs that prevents a consistent and structured approach to coordination. In terms of AARs, the DCP has weak monitoring and evaluation capabilities.

Shared values: One important finding from the study is that there is a deep commitment amongst DCP and the CPC members to serving affected communities and prioritising public safety. However, there is a disjoint between its commitment and day-to-day operations because existing policies are not rigorously enforced. The DCP does not offer comprehensive training programmes to ensure stakeholders' equal knowledge and understanding of disaster management. To strengthen a common understanding the DCP should ensure that the shared values are consistently reinforced through policies, operational practices and training programmes. This

practice should permeate all levels of the DCP, CPCs and all parties that respond to disasters. This process should serve as a unifying force driving the DCP's actions during disaster response. Another shared value involves collaborative partnerships as has been evidenced by the development of the EOC by a private partner. However, the collaborative drive is low and findings revealed selective partnerships that exclude other stakeholders such as the private sector, academia and international embassies.

Style: In terms of DCP's leadership approach and organisational culture, the following findings were found.

Laissez-faire leadership style: The laissez-faire leadership characteristics are explained in this chapter. This type of leadership presents coordination challenges because there is a risk of diminished transparency and accountability. Currently, the DCP leadership fails to hold individual CPC members accountable for their inactions. This type of leadership can also lacks a common framework and set of expected behaviours. The findings revealed that some organisations behave according to their own rules.

Centralised decision-making: The DCP leaders centralise their decision-making. Sometimes the relaying of information is delayed due to the absence of the required directive. This practice hinders swift decision-making, causes barriers to information sharing and prevents a prompt and effective response.

6.7 Key constructs that guide the development of a KM framework

This section addresses Research Question 4 of this study, which reads: "What are the key constructs that guide the development of a KM framework to improve coordination and collaboration among emergency responders in Zimbabwe?. To answer this question, the researcher critically analyzed the responses provided by participants in relation to Research Questions 1 to 3. This analysis focused on identifying the key constructs necessary for developing a KM framework aimed at enhancing emergency and crisis response. In pursuing objective 1, the researcher examined the current coordination mechanisms and collaboration practices utilised by the DCP. This examination aimed to identify the strengths, weaknesses, opportunities, and threats associated with the existing framework, as well as potential barriers to effective coordination and information sharing among emergency responders. The identified barriers were systematically recorded in a table format for clarity and ease of reference (Table 6.2).

Following this analysis, recommendations addressing the primary challenges identified were formulated. These recommendations were then categorised, resulting in the establishment of key KM constructs that informed the development of the framework. For instance, the civil protection structure emerged as both a current coordination mechanism and a barrier to effective collaboration. This dual role highlights the need for specific issues to be addressed, as detailed in the accompanying table (Table 6.2). Through this analytical process, the KM constructs were derived from the findings presented in this chapter, reflecting the critical insights gained from the research.

Table 6. 2: KM Constructs

COORDINATION	RECOMMENDATIONS TO ADDRESS THE BARRIER	KNOWLEDGE
BARRIER		MANAGEMENT
		CONSTRUCT
Civil Protection	Provide CP offices at the provincial and district levels.	
Structure	 Strengthen DCP structures at the ward and the village level in each district. 	
	 Establish community-based contact points closer to the affected areas. 	
	• Establish a team of volunteers who are familiar with local and IK in each village. These	Structure
	people will act as information sources, providing a clear picture of the ward's risks and	
	vulnerabilities.	
	Revise the CP structure to a hybrid structure that involves centralisation at the national	
	level and decentralisation at the district level.	
	Members of the DCP at the provincial and district level should be skilled and experienced	Capacity Building
	in DM because DM requires specialised skills, experience and knowledge.	
	Facilitate regular workshops for CPC members and DROs and embark on joint training	
	programmes and simulations to prepare the teams for effective response.	
	Establish a clear collaborative governance framework to define who leads in the event	Governance and
	of a certain type of disaster, together with the responsibilities, roles and decision-making	Compliance
	processes for participating organisations. Develop SOPs for disaster response activities	
	Implement monitoring and evaluation mechanisms to hold DROs accountable for their	Monitoring,
	roles and responsibilities.	Evaluation
	Consider the establishment of a hybrid CP structure.	Structure

Disaster	Review and strengthen the existing laws regulations that forbid political interference in	Governance and
Communication	disaster information dissemination.	Compliance
	Promote granular data collection, monitoring and risk assessment.	Knowledge Capture
		and Acquisition
	• Develop the data capture and acquisition capacity of field personnel and volunteers	Capacity Building
	within the wards.	
	Ensure the creation of multilingual disaster content.	Knowledge
	Ensure inclusive communication.	Dissemination
Low e-govern-	Conduct an assessment of the DROs' informational requirements and information	
ment Uptake in	sources.	
Zimbabwe	• Conduct an assessment of the disaster-related information currently available on the	Knowledge
	websites of various government ministries and agencies.	Identification
	• Identify the inconsistencies, gaps and limitations in the accessibility and content of the	
	information as required by the DROs.	
Lack of	Establish strategic partnerships with international organisations.	Knowledge Sharing
Resources	• Establish a community resource mobilisation and coordination programme.	and Collaboration
Culture	Allocate more funds to CP issues.	Governance
	For pooled resources, arrange for each responding organisation to keep a minimum	
	threshold at the local level.	
	Consider a decentralised approach.	Structure

• Implement initiatives such as joint training sessions, simulations and workshops for	
DROs and CPCs. The aim being to allow to stakeholders to appreciate disaster	
response, the importance of unity, collective action, shared problem-solving and	
developing a shared understanding of DM priorities.	
• Implementing educational and outreach programmes for communities, including the	
marginalized groups, to avoid political expediency, help them identify and address the	
underlying political and social tensions and encourage them to solve their challenges.	
• Suggest a platform for dialogue and conflict resolution to ensure a conducive	
environment for disaster response that will eliminate negative social and political barriers	
to effective disaster response.	Capacity Building
• Develop targeted joint training programmes, establish a shared vision for disaster	
response and implement open dialogue and consensus-building workshops during	
which DROs' priorities, roles and responsibilities are aligned with disaster response	
priorities.	
• Encourage or develop mentoring programme through which disaster knowledge is	
transferred from more to less knowledgeable members in order to share and preserve	
valuable disaster knowledge.	
CPC members should embark on the rotation of sector representatives so that they can	
take turns attending CPC meetings.	
DCP should also organise regular training sessions and workshops for representatives	
of CPC that includes all sectors, stakeholders and communities.	

 among responders and refine its collaborative framework Assign a designated 'boundary spanner' who plays the role of promoting a collaborative Governance mindset, acts as a bridge between the different organisations and represents their interests. Review the current laws and regulations to ensure that every stakeholder is included in the disaster response process.
 Assign a designated 'boundary spanner' who plays the role of promoting a collaborative mindset, acts as a bridge between the different organisations and represents their interests. Review the current laws and regulations to ensure that every stakeholder is included in the disaster response process.
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 Review the current laws and regulations to ensure that every stakeholder is included in the disaster response process.
the disaster response process
 Provide training to help those who participate in the AARs to effectively give feedback,
foster a culture of continuous learning and highlight the challenges of self-delusion.
Implement mechanisms to document key members' knowledge, best practices and Knowledge Capture
experience. and Acquisition
Promote a shift in mindset towards proactive knowledge-seeking behaviour, open Leadership, Change
communication and cross-functional collaboration. The aim being to foster leadership Management and
commitment and model a knowledge-oriented behaviour to drive cultural transformation Communication
across the organisations.
Ensure that after every event, ethical AARs are performed, encourage a constructive Monitoring and
approach to feedback whereby stakeholders feel safe to openly discuss mistakes, Evaluation and
challenges and areas for improvement. Continuous
Improvement
Poor Disaster Develop, implement and manage a centralised disaster knowledge repository to address Knowledge Storage,
Knowledgethe problem of silos and the lack of disaster information.Sharingand
Management Dissemination

•	Decide on the type of information that should reside in the centralised disaster	Knowledge
	knowledge repository.	Identification
•	Deploy a network of sensors and devices throughout the communities to capture real-	Knowledge Capture
	time data according to the various parameters set by the DCP.	
•	Employ big data processing frameworks.	Knowledge
		Processing and
		Analysis

6.8 Chapter summary

This chapter presented and analysed key findings from the study. The study used a qualitative approach and findings from a diverse category of responders were presented and analysed. Data was collected from a diverse range of stakeholders to allow for a comprehensive understanding of the phenomenon according to the needs of the various stakeholders. Results from each responder stratum was presented and a cross-case analysis performed after each identified factor. The chapter initially discussed the findings on the current coordination and collaboration practices employed by the DCP. The next section explored the potential barriers to effective disaster response. Lastly, the chapter provided the identified challenges, presentation and analysis of findings on a proposed set of KM strategies. The next chapter presents the discussion of findings.

CHAPTER SEVEN

DISCUSSION OF FINDINGS

7.1 Introduction

This chapter synthesises and analyses the findings from the preceding chapters and explores their implications and significance in more detail. The chapter unpacks and interprets the key findings. It addresses Objective 1: To examine current coordination mechanisms and collaboration practices employed by DCP in emergency response; Objective 2: To identify the potential barriers to effective coordination and collaboration amongst the emergency responders in Zimbabwe; and Objective 3: To recommend key Knowledge Management (KM) strategies that DCP can implement to ensure effective coordination and collaboration among emergency responders in Zimbabwe. In addition, the chapter discussed the theoretical, practical and empirical significance of the findings, highlighting their potential consequences for future research, policy and/or practice. Potential reasons for alignment or contradiction with prior reviewed literature was also discussed. The chapter road map below provides a guide for the reader.



Source: Author

7.2 Current coordination mechanisms and collaboration practices employed by the DCP.

The first research objective was to investigate the current coordination mechanisms and the DCP collaboration practices employed by in emergency response. Nine mechanisms/practices were identified namely: (1) civil protection structure (2) disaster information flow (3) disaster knowledge management (4) interagency coordination committee (5) capacity building (6) incident command system (7) memorandum of understanding (8) standard operating procedure and (9) disaster debriefing and knowledge sharing. The following sub-sections discusses each of these mechanisms.

7.2.1 Civil protection structure

The findings in this study revealed that disaster response requires the coordination and collaboration of various agencies and stakeholders with diverse capabilities, responsibilities and resources. It uses a multisector approach and the structure is clearly defined. This structure represents the formal arrangements that are designed to enable cross-boundary coordination. From a theoretical perspective, the current findings align with concepts on organisational and network structures (Branda et al., 2018; Celik & Corbacioglu, 2018).

From a practical lens, the CP structure serves as a common important coordination and collaboration mechanism for improving crisis response. The DCP's multisector approach brings together various agencies, NGOs, private sector entities under a unified framework. Respondents across cases concur and reveal that there is a clearly laid-out institutional framework. The formal lines of authority and reporting structures are clear from the national to province to district to ward with the Director, SPAD and DDC leading the coordination respectively. This structure is commendable and endorses prior literature (Celik & Corbacioglu, 2018; Manyoma et al., 2019; Schakel & Wolbers, 2021) which states that for an organisation to ensure prompt decision-making and efficient resource allocation, there should be clear leadership structures and designated roles for members to avoid confusion and/or duplication of effort to minimise gaps in service delivery. It also emerged across cases that the DCP uses a multisector approach that brings together the government ministries, humanitarian organisations, private sectors and local leaders. Thus, it leverages the expertise and resources of various organisations making it easier for Zimbabwe to rely on pooled resources. This finding resonates with that of Muir-Wood (2016) who states that disaster response is a joint responsibility that requires coordinated response from all parts of the society. The multisector approach indicated in this study conforms with that of Branda et al.

(2018) who posits that, in high performing disaster organisations, actors can leverage on each other's strengths, thus, delivering a more robust strength.

However, some researchers discovered that relying solely on formalised coordination mechanisms can sometimes limit spontaneous grassroots-level collaboration and improvisation that emerge in crises (Gardner, 2013). Thus, for DCP to effectively use the CP structure as a coordination mechanism, a balance needs to be created between the need to establish ordered crisis responses and the emergency of spontaneous inter-organisational collaboration under stressful conditions (Moynihan, 2008).

7.2.2 Disaster information flow

The current findings relating to disaster information flow as a coordinating mechanism substantiate earlier research findings (Andreassen et al., 2020a; Gardner, 2013) stating that coordination is achieved by proper information flow between organisations and individuals participating in the crises response. From a theoretical perspective, this current finding aligns with concepts on KT (Esser & Janus, 2023; Oh & Han, 2020) and boundary spanning (Curnin, 2015; Qi et al., 2022; Wukich et al. 2017). Findings in this study revealed that top-down communication is usually triggered by an EW. Information flow is well defined and communication is two-way. Bottom-up communication is primarily triggered by a disaster event and the communication moves along a well-defined CP structure. However, urgent communication reaches the DDC along various channels and, thus, saves lives. This finding aligns with Nowell et al. (2017) who observed that a response network should have the capacity to increase network resilience by offering multiple pathways via which information flows. However, a significant implication of this finding is that the fact that people can disregard the established communication protocol in the event of severe disaster implies that these structures are bureaucratic and rigid and may not be suitable in urgent complex situations.

From a practical standpoint, by effectively managing how disaster information flows across organisations, the DCP can significantly improve coordination and collaboration. A clearly defined information flow can foster open and transparent sharing of disaster information that, if well maximised, can result in effective coordination of disasters in Zimbabwe.

Numerous studies have been done on the role of the managing information flow among disaster responding organisations (Bjerge et al., 2016; Curnin, 2015; Stanton et al., 2017; Usuda et al., 2017; Wankmüller & Reiner, 2019; Waring *et al.*, 2018). Thus, the current finding on information flow structure as a disaster coordinating mechanism aligns well with these empirical findings. However, some studies have highlighted challenges associated with information flow within organisations such as organisational and technological barriers that can hinder the seamless flow of disaster information and knowledge (Andreassen et al., 2020a; Chipman & Wuerfel, 2008; Soini et al., 2009). Thus, for DCP to effectively use the information flow structure as a coordinating mechanism, there is a need to consider the contextual factors that can shape the effectiveness of information flow. These may include the DCP for example, for top-down communication, the DCP should consider the literacy level and education level of the communities they want to communicate with as well as their socioeconomic status. Some marginalised communities may have less access to information channels and, as such, the DCP and response organisations should tailor their messages accordingly.

The current findings have several implications for disaster response organisations, particularly the DCP. To effectively maximise on this strength of clear and well defined information flow, the DCP should strengthen its disaster information management capabilities by investing in the development of robust KMS focusing on disaster knowledge collection, processing and dissemination capabilities to support coordination and collaboration during disaster. This implication applies to all CPC members as well as other stakeholders that respond during crisis. The DCP should drive, through legislation, the promotion of inter-organisational information and knowledge sharing to allow for seamless exchange of information across boundaries. The DCP should also facilitate training programmes to enhance the skills and competencies of boundary spanners.

7.2.3 Disaster knowledge management

KM has been identified as a coordinating mechanism used by the DCP. Three aspects under KM were analysed and these are (1) how the DCP collects or acquires disaster knowledge (2) how the DCP organises, processes and stores the acquired knowledge (3) how the DCP shares the available disaster knowledge. Effective KM supports coordinated data-driven decision-making. It ensures that relevant disaster knowledge is readily available to the various response organisations at the right time to allow them to make sound data-driven decisions (Branda et al.,

2018; Steelman et al., 2014). Disaster KM as a coordinating mechanism is confirmed by Oktari et al. (2020) who argues that the ability of responders to quickly react to a disaster depends on the quality and nature of information at their disposal, as well as the extent to which they understand the current situation.

Knowledge capture: From a theoretical lens, the finding on knowledge capture as a coordinating mechanism aligns well with the core principles of OL (Chiponde et al., 2022; Esser & Janus, 2023; Oh & Han, 2020) and absorptive capacity (Edmonstone, 2018). These theoretical concepts argue that the ability of an organisation to effectively collect, store, share and utilise knowledge is crucial for its effectiveness. The findings of this study revealed that DCP captures disaster information and knowledge, however, it is weak in terms of gathering disaster data. They rely on data generated by their partners that, from a practical perspective, presents numerous challenges. The weak data collection capabilities by DCP hinders its ability to become a knowledge driven CP organisation. The findings also revealed that for reports from the communities, the DDC assembles an assessment team at the district level to assess the reported case for authenticity and trustworthiness. This finding reinforces prior research's (Bunker et al., 2014) claim regarding the need to guarantee the accuracy, authenticity, legality and reliability of information. However, this process tcan present challenges to effective crisis response and coordination, such as delays in response. In addition, the district assessment team may lack contextual understanding and some of the indigenous knowledge that the community possesses regarding the reported case. This situation contradicts other findings (Ahangama & Prasanna, 2017; Chisita & Fombad, 2020) who argue that responders should built upon the community's indigenous knowledge. Findings also showed the respondents' displeasure of the current manner in which councillors report disaster issues. Respondents perceived a councillor as a political figure with the potential for politicising the disaster. The community also highlighted a lack of a conveniently situated suboffice as hampering effective communication and hence disaster knowledge capture by the DCP. This view concurs with Jha et al. (2018) who identified proximity as a requirement for effective response.

Various empirical evidence stressed the importance of the systematic capture of disaster related knowledge and knowledge repositories (Chaturvedi & Singh, 2021; Oktari et al., 2020). Findings from these studies underscored the need for DCP and DROs to develop robust knowledge capture processes and technologies. However, the major challenges associated with the knowledge-capture centre related to the issue of standardised data formats, challenges with

capturing tacit knowledge and resistance to KS among personnel (Chipman & Wuerfel, 2008; Thompson, 2006). These challenges can hinder the effective capturing of disaster information. A few studies have warned against over emphasising knowledge capture without a clear plan as to how that data can then be leveraged and applied ensuring the practical value of the captured data (Aming'a, 2015; Harrinson, 2021).

The above findings imply that DCP should establish comprehensive knowledge capture processes, which should be seamlessly integrated into DCP and other disaster response organisations' daily operations. The capturing of relevant data should become part of DCP's routine and an embedded practice. This process should include incident reports, AAR, capturing lessons learned and storage of critical data, The DCP should develop standardised taxonomies, data models, metadata schemas to ensure the consistent and meaningful capture of disaster-related knowledge (Adem et al., 2018; Sederholm et al., 2021). However, the DCP should have a plan delineating how the collected data will be utilised and shared across stakeholders.

Disaster knowledge storage, processing and analysis: This current finding regarding KM storage, processing and analysis aligns with the key concepts and theoretical foundations of OL (Chiponde et al., 2022; Edmonstone, 2018; Esser & Janus, 2023; Oh & Han, 2020). According to these researchers, the collected data should be stored and organisations should be able to comprehend and use the data to support their strategic objectives. The findings from this study revealed that DCP lacks a centralised disaster knowledge repository at district, province and national levels. The information gathered at district level is typed and stored in computers and documents are sometimes printed and filed. The DCP acquires information from various sources and, therefore, disaster knowledge and databases are strewn across different partners, ministries and institutions.

From a practical perspective, effective storage, processing and analysis of disaster related knowledge can significantly improve disaster coordination and collaboration in disaster response efforts. If implemented effectively, this coordinating mechanism can enhance DCP's ability to support evidence-based decision-making. DCP should be in a position to store and analyse disaster information related to past disaster events, allowing for the identification of patterns, trends and lessons learned (Schakel & Wolbers, 2021). Such knowledge will inform DCP's response strategies and decision-making processes. This practice can then lead to effective coordination and, hence, improve response efforts. In addition, the stored disaster information will
allow the DCP to develop predictive models and decision support systems that can assist DCP and DRO personnel to make timely sound decisions.

Numerous empirical studies have highlighted the importance of knowledge repositories, processing and analysis in improving the effectiveness of disaster response efforts (Ley et al, 2014; Sydnes et al., 2017; Upadhyaya, 2008). The current finding resonates with these prior studies and stresses the importance of knowledge processing and repositories. DCP's lack of a centralised disaster knowledge repository and information-sharing platforms significantly undermines its effectiveness in disaster coordination. This view aligns with the reviewed literature's claim that without the repository, there exist delays and misaligned priorities, compromising disaster response and recovery efforts. Others have identified the challenges associated with the siloed and fragmented nature of disaster related data and the benefits of establishing a centralised disaster knowledge repositories (Soini et al., 2009).

The research findings imply that the DCP should invest in the development of a comprehensive KMS that can effectively store, process and analyse disaster-related information. These systems should store data at district level according to each ward and village to cater for microclimatic conditions. DCP should also establish robust data governance frameworks, including data quality protocols, standards and integration strategies to ensure the seamless acquisition, storage and dissemination of disaster-related knowledge. DCP should adopt advanced analytics and visualisation technologies to gain insights from the processed and stored knowledge. It should also leverage the knowledge to develop decision support systems and other knowledge-based applications to assist personnel in making more informed and timely decisions during disaster response.

The types of information that proved to be key to decision-makers and, thus should be found in the repository include EW, hotspot analysis, stakeholder mapping and past experience. However, respondents commended that the current state of EW is not sufficiently accurate to ensure effective disaster response.

Disaster information sharing: The finding on knowledge sharing as a coordinating mechanisms employed by the DCP aligns with theoretical concepts on OL (Esser & Janus, 2023; Oh & Han, 2020) and knowledge based view of the firm (Curado & Bontis, 2006; Srivastava, 2022). Findings reveal that disaster response organisations require readily available, relevant and close-to-

accurate information to make sound decisions during a disaster response operation. However, currently the DCP does not have readily available information to share with those requiring it. Its website is down and there is no stand-alone IT unit within the DCP. This situation makes accessibility of disaster information a challenge. This study departs from the views of Chisita and Fombad (2020) who identified websites as a tool that can be used to support collaboration. The findings revealed that, however, there are other organisations with platforms that provide good sources of information such as the Food and Nutrition Council and UN Agency organisations. However, this over-reliance on other organisations for information challenges DCP's effectiveness. The different and siloed sources may provide conflicting information and may result in responders wasting valuable time reconciling information from the various sources. This problem also hampers the ability of DCP and DROs to maintain an up-to-date understanding of the evolving situation. This finding deviates from Usuda et al. (2017) who argues that there should be effective sharing and unification of disaster information so that each emergency responder can quickly and efficiently respond to disaster. It emerged in this study that different organisations have different disaster informational needs depending on their areas of work. As such, they require relevant information to make sound decisions. This finding resonates with that of Stanton (2016) who points out that effective information sharing does not mean the exchange of information with every emergency responder, it means timeous sharing of only the information that is of relevance to the emergency responder's role or function.

The current findings imply that for DCP to effectively use KS as an effective coordinating mechanism, they should explore the use of technology enabled solutions, such as knowledge repositories, to ensure that there is readily available disaster information to share with responders. They should also utilise collaborative platforms and data visualisation tools to ensure that only relevant information is made available to those that need it, ensuring accessibility and usability of the shared knowledge assets. To ensure effective KS, the DCP should strengthen interpersonal networks to ensure informal exchange of information.

Despite the fact that this coordinating mechanism (KM) has been widely accepted as a critical enabler of effective disaster response (Edwards, 2011; Oktari et al., 2020) there exist variations and contradictions in the findings of previous studies. For example (FEMA, 2017; Hawkins, 2007; Schakel & Wolbers, 2021; Sederholm et al., 2021; Skar et al., 2016) highlighted command and control structures as prominent in certain disaster response set ups. There is need for future

researcher to investigate the specific cultural, organisational and environmental factors that may influence the applicability of C2 and the KS structures.

7.2.4 Interagency coordination committee

The findings in this study highlight the importance of the cluster approach as a well-recognised platform for information sharing among agencies in the Zimbabwean context. This finding dovetails with that of Rouhi et al. (2019) who found the cluster approach as an coordination mechanism among international and national organisations. This aligns with the findings of Branda et al. (2018) who described high-performing networks as those promoting interagency cooperation and fostering collaboration among responders. However, despite the significance of the cluster approach, the NGOs identified a weakness in inter-cluster communication. They pointed out that the siloed nature within a cluster can hinder the overall coordination and integration of the response effort. These findings resonate with Usuda et al. (2017) who also identified a lack of mutual information exchange as hindering effective coordination. Their research emphasised the importance of coordinated information sharing for effective DM.

Future researchers can focus on understanding the barriers, challenges and success factors associated with the functioning of the Interagency Coordination Committee to identify areas that can be improved. The findings may also inform the development of specific policies, strategies or technological solutions to enhance the coordination and collaboration of the committee members and the overall disaster response efforts. Thus, for DCP to effectively use the cluster approach as a coordination mechanism, it is important to address the barriers in inter-cluster coordination to ensure a more holistic responsive DM approach in Zimbabwe

7.2.5 Capacity building

The findings from the NGOs showed contrasting responses with some saying the DCP offers training while some doubted it. This lack of unanimous agreement shows a gap in DCP. It is either that their training is not sufficiently comprehensive, i.e., it caters for some groups while leaving others out, or the respondents have never attended a training programme facilitated by the DCP. This finding diverges from (Abbasi et al., 2018; Skar et al., 2016)'s perspective who asserts that training exercises help improve communication and coordination between participating actors.

7.2.6 Incident command system

The reviewed literature pointed out that the adoption of an incident command system is a good coordination mechanism for crisis response (Jha, 2018). Findings in this study, however, revealed varying perspectives on DCP's implementation of the ICS. The terminology was unfamiliar across all cases with some respondents unsure whether DCP implements the ICS. This lack of common understanding of DCP's implementation of the ICS raises concern about its effective implementation despite Rouhi's (2019) assertion that it reduces confusion and allows for an efficient and well-organised response operation. This finding implies that there is a need for DCP to further strengthen the implementation and integration of ICS, thus, ensuring that all relevant stakeholders are equipped, trained and aligned with the ICS principles and protocols (Jha et al., 2018). The findings also revealed that the DCP mostly uses the ICS during simulations because the idea of any response effort is to save lives and property rather than strictly following the system. This perspective by the DCP enriches prior findings by Schakel & Wolbers (2021) who discovered that crises often evoke an unexpected turn of events requiring on-the-spot decisionmaking, flexible structures and informal coordination, thus, requiring frequent adaptation on many occasions during the crisis. This same line of thinking was echoed by some NGO respondents who criticised the ICS's top-down approach that works well only for disasters declared at the national level. The experts also identified gaps in the ICS and recommended a collaborative approach rather than a command approach (Zhang et al., 2019)(J. Zhang et al., 2019).

7.2.7 Memorandum of understanding

MoUs are a means for establishing a shared understanding of goals, responsibilities, roles and exchange of information, resources and expertise among partnering organisations (Sundnes, 2014b). The findings revealed divergent of views on whether the DCP uses MoUs with partners seeking to assist the affected community, with the majority saying partners require MoUs while a minority said they do not. There was great concern because some respondents complained of the lengthy time that the DCP takes in processing the MoUs with others saying it is circumstantial. This disconnect between the findings on the MoU process implies that there is a need either to streamline the process of being accepted to work in an affected community or for greater transparency to ensure a more coordinated system that prioritises the needs of the affected people. This finding implies that DCP has a systematic approach to establishing and maintaining inter-organisational partnerships for effective DM. This bureaucratic process has negative

implications on the effectiveness of disaster coordination because it affects the timely deployment of assistance and resources to the affected communities.

7.2.8 Standard operating procedures (SOPs)

Contrasting perspectives on the availability and implementation of SOPs by DCP are revealed in this study with CPC members acknowledging the availability and implementation of SOPs, however, they identified a gap in enforcement because some members who complement the department's efforts, fail to adhere to SOPs. SOPs are meant to establish clear protocols, guidelines and procedures for coordination and collaboration among various response organisations (FEMA, 2017). It is questionable, therefore, whether the organisations are aware of the SOPs or they just decide not to follow them, thus undermining the effectiveness and enforcement of the SOPs across various organisations. The NGO group had mixed views with the majority stating that the DCP does have SOPs in place while a minority were not sure. The previewed literature reported that the coordination process is commonly planned and formalised as SOPs) in organisations (Andreassen et al., 2020a). The lack of knowledge of the SOPs' availability and the lack of adherence to them shows a lack of accountability on the part of DCP that hinders effective disaster coordination. Without SOPs, the chance of fragmented and uncoordinated efforts increases. According to Andreassen et al. (2020a), SOPs enhance response effectiveness as incident commanders then control and coordinate response operations through specified routines. There is a need for future researchers to investigate the current coordination mechanisms specifically focusing on understanding the existing SOPs, their scope, process of revision and the level of integration, compliance and implementation among participating agencies. The overall aim of this research being to improve disaster response through SOPs.

7.2.9 Disaster debriefing and knowledge sharing

From a theoretical perspective, AAR and KS enable an organisation to engage in selfintrospection. AARs and KS align with the theoretical foundation of OL (Esser & Janus, 2023). The findings from DCP revealed that AARs are undertaken with the committee members who are experts in information gathering and research leading the process. However, CPC members identified a gap in how the gathered data is then stored, accessed by those who need it and shared among the responders. They also expressed concern on the application of the generated knowledge. This perceived inability of DCP to effectively gather, document and disseminate information regarding the lessons learned from past disaster events can hinder continuous improvement and, hence, the future effectiveness of disaster response in Zimbabwe. This gap can result in the country continuously repeating the same mistakes. This finding contradicts those of FEMA (2017) and Qadir et al, (2016) who argue that in order to be effective the DR needs to go through the post-crisis phase that focuses on improving future crisis response by summarising lessons learned and proposing adjustments to existing tools and methods.

7.3 Potential barriers to effective coordination and information sharing among emergency responders?

7.3.1 Civil protection structure

Several gaps within the CP structure have been revealed by the cross-case analysis. From a theoretical perspective, this finding portraying the CP structure as a barrier aligns with theoretical concepts on organisational structures that emphasise the importance of flexible, coordinated and adaptive organisational structures for effectively managing disasters (Celik & Corbacioglu, 2018; Manyoma et al., 2019). The findings revealed a lack of dedicated individuals at the provincial and district levels solely responsible for CP issues. This deficiency presents many challenges because the use of CPCs alone may result in conflicting priorities (Adem et al., 2018). Each ministry has its mandate and a set of priorities that may not align directly with DM. This practice may lead to differing perspectives and disagreements resulting in delays in decision making. The findings also revealed an absence of structures at the ward level that has negative implications for disaster response. The DCP structure at the ward and village level has limitations because it tends to give blanket recommendations for the district rather than integrating community-based or ward-based disaster-related knowledge that can enhance the relevance and effectiveness of the response strategies (Chisita & Fombad, 2020). In addition, the fact that community members may not feel directly responsible for the outcomes of DM initiatives often results in a lack of commitment, ownership and accountability. Respondents also identified a lack of clarity in roles and responsibilities, especially when specialised ministries take over disaster coordination. This situation leads to ambiguity and delayed information exchange. This unclear leadership may significantly contribute to the ineffectiveness of crisis response in Zimbabwe. It also may explain why different organisations tend to operate independently instead of coordinating their efforts with other response agencies, why some organisations compete rather than collaborate and why some well-resourced organisations tend to take over coordination and do not report to anyone. This contradicts the views of Jha et al. (2018) who observed the need for consensus on decision making and leadership so as to avoid confusion during response.

There is decentralised decision-making at DCP because district-level officials fail to communicate disaster information before receiving approval to do so from the province. Despite the benefits of centralised communication, this practice can have a detrimental effect on disaster coordination because it can slow down the response effort leading to inefficient response. As such, there is need for DCP to consider the hybrid structure that allows the organisation to be agile, flexible, innovative and to adapt to new challenges (Brugh et al., 2015). The DCP also runs the risk of continuity and sustainability because some heads of departments, who are members of the CPC, delegate CP responsibilities especially when faced with competing priorities. The practical implication of this finding is that the DCP should develop an efficient knowledge base that captures and stores the tacit knowledge from the committee members because, currently, the DCP may fail to fully internalise the committee members' knowledge and, thus, limit the effectiveness of disaster response. This practice hinders DCP's capacity to learn from previous experiences and can result in the loss of institutional memory, making it difficult to build upon past experiences.

The findings described a "laissez-faire" type of leadership style in which the DCP uses a 'handsoff' approach, consequently members may decide not to attend meetings but are not reprimanded for their absence. There was also an outcry from respondents who indicated that some members also failed to carry out their assigned duties without suffering any form of repercussion. The DCP is not actively monitoring or enforcing expected behaviours. However, this problem can also be attributed to the lack of dedicated personnel because the current personnel may be overwhelmed with their primary duties. This practice may also be the reason why certain agencies may pursue their priorities, leading to uncoordinated efforts. Community members indicated that the distant location of the DDC's office (Jha et al., 2018) makes reporting disaster related issues a serious challenge for communities, owing to their lack of resources such as bicycles, phones, airtime and even power challenges. The finding indicating that the CP structure is a barrier to effective disaster response implies that the DCP needs to engage in process reengineering and restructuring. The DCP should put strategies in place to support the decentralisation of decision making (Brugh et al., 2015). The disaster coordinating organ should regard the CP's current structure as a barrier to enhancing the effectiveness of the disaster response system.

7.3.2 Disaster communication

Communication has been identified in this study as one of the major challenges to crisis coordination O'Brien et al. (2020) who observed that failures in disaster response have been largely attributed to failures in coordination and communication. The findings revealed that disaster information is sometimes withheld, announcing disaster information is delayed or figures downplayed or supressed. This finding contradicts those of Waring et al. (2018) who posit that responding effectively to disaster relies heavily on the timely capture and sharing of accurate information. This suppression of disaster information also undermines public trust in the response agencies and can result in inappropriate responses being implemented in affected communities. This practice implies that decision-makers lack access to the necessary reliable and comprehensive information when preparing for future disasters. It was also evident from the research findings that the DCP lacks sufficient relevant information to share with responders. This finding is consistent with that of Andreassen et al. (2020a) who found that during the Hurricane Katrina disaster, a lack of information and SA hampered the C2 and, hence, the response effort. The findings revealed that disaster information is usually generalised for the whole district. These findings also align with those of Andreassen et al. (2020a) who observed that the granularity of information also acts as a barrier to effective information sharing amongst the responders, resulting in generalised communication which fails to cater for microclimatic conditions. A lack of infrastructure also hinders effective disaster communication in Zimbabwe. This finding complements that of Branda et al. (2018) who observed that clear processes and infrastructure for collecting, analysing and disseminating information during crisis are necessary components of high performing networks.

7.3.3 Low e-government uptake in Zimbabwe

The findings revealed that most of government department either do operate websites or those that exist contain information that is outdated or not sufficiently detailed to allow responders to make sound decisions. This finding contradicts that of Chisita and Fombad (2020) who identified a website as a knowledge sharing strategy. The siloed nature of disaster information due to a lack of a centralised disaster repository lessens the ability of DCP to effectively coordinate disaster response. From a KM perspective, e-government systems provide good platforms for efficient

information sharing amongst government line ministries. They also facilitate real-time data collection, analysis and dissemination that enables timely decision making. E-government systems also provide mechanisms for capturing and retaining knowledge such as SOPs, lessons learned and best practices. Thus, this ineffectual operation of government departments' websites may limit the accessibility, availability and integration of critical information. This finding implies that there is a need for the central government to generate a comprehensive strategy to promote the adoption and utilisation of digital technologies in DM in Zimbabwe. The KM framework, therefore, incorporate strategies to address the barriers posed by low e-government uptake such as promoting the adoption and utilisation of digital platforms and e-government services among disaster response organisations.

7.3.4 Lack of resources

The findings revealed the lack of funding from central government is a major barrier to effective disaster response in Zimbabwe. This finding conforms to that of Aldrich (2019) who argues that governments departments depending on national government for financial and administrative resources can stifle crisis response. The DCP relies heavily on external funding, specifically the NGO sector to implement most of their activities. This finding dovetails with that of Shork et al. (2022) who observed that NGOs have been playing a significant role in responding to crisis situations across the globe. Resources identified as lacking included communication devices such as phones and airtime, evacuation centres, prepositioned material, vehicles at the district level to ensure DDC mobility, and infrastructure in general including transportation, communication and utilities. This finding aligns with that of Aldrich (2019) who observed that effective crisis coordination requires a sound logistical infrastructure to allow the society to access personnel, material and information. It also emerged that staff and resources to strengthen structures at the ward level were also lacking (Duong & Chong, 2020). The practical implication of this finding is that the DCP should proactively identify and map the critical resource needs for disaster coordination. It should also foster and strengthen partnerships and collaborations among DROs, the private sector as well as international organisations to mobilise and share resources. This finding also implies the need for DCP to have a comprehensive resource management strategy within the KM framework, resource assessment needs should be conducted and critical resource needs and gaps identified.

7.3.5 Culture

The findings revealed that DCP relies heavily on external sources for resources and funding. As noted by Chisita and Fombad (2020), the DCP can minimise over reliance on partners by making use of the local communities. Local communities possess valuable knowledge about the disasters that affect them, their hazards, environment and vulnerabilities and the coping mechanisms that have worked (Chisita & Fombad, 2020). By knowing the risks that are likely to affect a certain community and which agents are available locally to address that particular type of disaster, disasters can be addressed effectively at the local level without relying solely on external assistance. DCP should therefore focus its attention on capturing and documenting the indigenous knowledge. By building comprehensive knowledge bases about the expertise that resides locally, lessons learned from previous disasters and indigenous knowledge, response organisations are empowered to respond to disasters locally without relying too much on external help. They can engage in participatory approaches by encouraging the community members to gather indigenous knowledge so that they can be integrated in the response efforts.

Consistent with the findings of Jha et al.(2018) who noted that disaster response operations are correlated with the country's political and cultural landscape, the current study found out that disasters within communities can be used to address political differences. However, this practice only worsens the crisis. Another cultural barrier is that of competition. DM is not the function of one organisation but requires the cooperation, collaboration and coordination of professionals, experts and agencies (Asamoah et al., 2018). However, findings in this study revealed the opposite because some response organisations compete for recognition and power, leading to ineffective disaster coordination. There is also a lack of accountability that results in corrupt practices by some DDC officials who request money from some disaster response organisations. This finding contradicts that of Boin and Lagadec (2000) who assert that humanitarian coordination is used as a tool to achieve organised behaviour that produces the desired outcomes such as efficiency, effectiveness and accountability in crisis response.

The findings revealed that some communities have strong cultural values, some places are also sacred and a lack of clear understanding of these issues can result in ineffective disaster coordination. This finding is in contrast to Muir-Wood (2016), who argues that local residents need to live in cultures that are respectful of disasters, in which families and businesses are mindful of their risks and threats. Some people are left out of disaster related activities by the

DCP, such as the private sector and academia, and this omission creates a barrier in crises response because responding to a disaster is everyone's responsibility. This findings contradicts that of Wang & Wang (2009) who argues that disaster response requires a critical mass of individuals and organisations with diverse skills.

Commitment, information sharing, mutual respect and trust have been identified as key success factors to effective collaboration (Duong & Chong, 2020). However, the findings revealed that there seems to be a lack of trust between DCP and the DROs. The partners should believe that the other stakeholders are able and willing to accomplish their duties as only through high levels of trust will effective collaboration exist (Adem et al., 2018; Prasanna & Haavisto, 2018). Trust is an important aspect in collaborative work because agencies that trust each other engage in joint action, problem solving and increase their information sharing.

7.3.6 Poor disaster knowledge management

The DCP's over reliance on third parties for data collection can affect the quality of data and has higher chances of data inconsistencies. NGOs may use different data collection tools, methodologies and standards but without effectively engaging in data collection, it may struggle to ensure standardised datasets. In addition, NGOs focus on specific areas of their work and typically collect information that helps them address their mandate but not necessarily the entire disaster. The NGOs may also introduce bias and create information gaps in their quest to address their mandate and objectives. Thompson (2006) argues that poor IM and failure to make prompt decisions act as barriers to disaster response efforts. According to Branda et al. (2018), high performing networks are proficient in IM and allow for a free and rapid flow of information from those who have it to those who need it in the appropriate quantity, format and time to inform strategic action (Steelman et al., 2014). However, contrary to this finding the current study revealed that disaster information is scattered across the various sectors. It is difficult for emergency responders to promptly acquire the required information. DCP lacks a central disaster knowledge repository, DROs operate in silos in Zimbabwe, maintain their independent repositories and only share information with their partners. However, this fragmentation of disaster information poses many challenges. Without a unified disaster information platform, SA and realtime understanding of the evolving situation become a challenge for responders.

In addition, the DCP lacks a structured approach to disaster information acquisition. They lack historical information and, as such, documenting and preserving institutional knowledge becomes a challenge. It is also difficult to learn from mistakes and lessons learned in past disasters. This findings contradicts other studies (Commonwealth of Australia, 2018), which argue that crisis decisions should be accurately documented and provide justifications for the decisions made throughout. These documented decisions then form both institutional memory and a frame of reference for others managing the crisis and act as a check point for cognitive biases (Commonwealth of Australia, 2018). This process helps in capturing lessons learned from the response effort and allows for continuous improvement. KM facilitates the development of organisational memory and, hence, reduces the chances of response agencies reinventing the wheel. In addition, a culture of competition as opposed to collaboration among responders was identified, as well as a gap in policies and a lack of a standardised approach to disaster response because partners do as they wish. According to Schakel and Wolbers (2021) there should be clear leadership structures and designated roles for members to avoid confusion during emergencies and enable prompt decision-making and resource allocation. AARs are performed after incidents, however, questions were raised regarding their documentation and sharing of lessons learned. There is a lack of standardised approaches for conducting AARs. This finding is contradictory to Sederholm et al. (2021) who stresses the need for standardisation to improve response efforts.

7.4 Key KM strategies for effective coordination and collaboration among emergency responders.

7.4.1 Developing a single repository for disaster management

A key tenet in KM is the importance of knowledge acquisition, storage, processing, analysis and sharing (Evans et al., 2014; Supermane & Mohd Tahir, 2018). The current findings suggest the development of a centralised disaster knowledge repository. This finding aligns very well with established theories in KM and validates models that highlight the need for developing databases, repositories and information systems to facilitate knowledge capture, sharing and reuse within an organisation (Oktari et al., 2020; Rohajawati & Akbar, 2021). This theoretical basis also relates to organisational memory which posits that lessons learned and organisational knowledge should be retained and made accessible. This finding aligns with that of Schakel and Wolbers (2021) who argue that effective disaster response organisations learn from their

experience and use this knowledge to enhance their overall response efforts. Thus, the establishment of a centralised knowledge repository will enhance DCP's effectiveness and resilience.

The practical significance of a centralised disaster knowledge repository is that it will address the challenges identified in this study. The findings revealed that some knowledgeable members within the NCPC, PCPC and DCPC failed to attend committee meetings, and, due to the valuable tacit knowledge they possess, their absence was felt. The DCP, therefore, should identify critical knowledge within the various sectors, document and institutionalise this knowledge and store it in the centralised repository. This KM strategy is in line with Dalkir (2013) who posits that when an organisation fails to locate and apply the specific knowledge required to meet the existing need, it misses opportunities and fails at a tactical level. When an organisation does not use the appropriate knowledge it fails at a strategic level. Currently, disaster information is siloed and scattered across sectors. It is difficult for response organisations to swiftly obtain the information needed to make sound decisions. The establishment of a centralised repository will address this challenge by providing a single access point, enabling a more coordinated and effective disaster response. Similar to this finding, Usuda et al. (2017) introduced the Shared Information Platform for DM (SIP4D) as an inter-organisational information-sharing prototype system. They suggested integrating existing individual information systems via a common interface to facilitate mutual information exchange. The centralised repository will address the current problematic situation in which stakeholders collect data according to their own standards. It will ensure that there is a systematic approach to disaster data acquisition as well as a systematic approach to knowledge sharing regarding lessons learned. This process will foster OL and preserve institutional memory even when personnel and leadership change over time (Esser & Janus, 2023). The repository will ensure every responder possesses SA and rapid access to the information they require to make sound decisions and best practices, hence improving coordination and collaboration among the various responders (Oh & Han, 2020). The repository will also include stakeholder mapping for everyone to view that will reduce or prevent or duplication of effort and increase efficient resource allocation.

Input to the central knowledge repository can include disaster information from line ministries or stakeholders or it can be data collected directly from the communities. The types of information common to most responders that allows them to make sound decisions include historical data on past disasters, IK about the area, a robust EW, expert knowledge, district profiles and vulnerability

assessment for the area. This knowledge expands Abbas et al.'s (2018) findings that responders need to exchange information on the extent of damage, number of victims affected, dimension of the required response and the complications to be expected.

The current finding for a need for a central knowledge repository substantiates prior empirical evidence on KM and DM. Prior research has consistently stressed the need to develop knowledge databases to ensure that disaster information is centralised and easily accessed by those who need it (Chisita & Fombad, 2020; Oktari et al., 2020). Although this finding aligns with some prior studies, other researchers found that merely implementing the technological practices will not reap the expected benefits. There is a need for a careful planning, integrating all three KM perspectives, i.e., people, processes and technology (Edwards, 2011; Rohajawati & Akbar, 2021; Tomé et al., 2022).

7.4.2 Investment in indigenous knowledge-based EWS

Promoting the development of indigenous knowledge-based EWS is an important KM strategy that the DCP can employ to improve the effectiveness of emergency coordination. The key tenets of KM are capturing, storing, sharing and leveraging diverse forms of organisational knowledge (Oktari et al., 2020). This knowledge can be tacit, explicit, context-specific or experiential. IK is a unique, context-specific, place-based form of knowledge that can provide insights about a village, ward and district (Chisita & Fombad, 2020) to aid in disaster preparedness and response. Practically, the DCP can leverage this practice by integrating the IK-based EWS with the scientific EWS that will yields several benefits for improving disaster coordination in Zimbabwe. The findings revealed that communities possess a wealth of knowledge that the DCP can tap into to improve the overall coordination of disaster. This knowledge includes subtle changes in the environment such as weather patterns, animal behaviour or natural indicators of impending disasters in their areas. With IK based EWS, localised culturally attuned signals and indicators of impending disasters are provided that allow for more timely alerts and enhance the proactiveness of the response organisations and the communities. This process also leverages the predictive capabilities and deep contextual understanding within indigenous communities. One of the key outcries from the community group was the issue of preserving IK, when DCP formalises the integration of IK based EWS into their activities it will help to address the communities' need to preserve IK which they fear is at risk of being lost over time as new generations come.

There is growing empirical evidence from various cultural and geographical contexts that highlight the need for IK-based EWS for improving disaster response and management (Josè Moisès et al., 2023; Mitiku & Hailu, 2017; Turyasingura et al., 2023). Studies have shown that EW indicators, such as weather patterns, animal behaviour and environmental cues, can provide predictive information that complements scientific EWS. Prior research has shown the need for IK and formal knowledge systems and how this practice has led to effective and comprehensive EW and response mechanisms (Josè Moisès et al., 2023). This finding aligns with these empirical findings. However, some researchers have highlighted challenges associated with this approach. Due to power dynamics, difficulties in validating the IK, cultural differences and resource constraints there can be challenges in integrating IK and formal knowledge (Josè Moisès et al., 2023). To integrate IK into the scientific EWS, there is a need for DCP to facilitate the systematic collection and validation of the IK for every district, stratified according to wards and villages. Thus, for DCP to successfully integrate IK based EWS into the formal EWS, it needs to consider the identified challenges and contradictions.

7.4.3 Capacity building

Theoretically this finding on the need for capacity building as a KM strategy aligns with concepts in the field of KM, specifically that of absorptive capacity (Edmonstone, 2018). KM theory emphasises the need for an organisation to develop organisational capabilities to allow it to effectively acquire, create, store, share and utilise knowledge (Oh & Han, 2020). The findings have shown that there is a need to train the community, CPC members, MPs and the leadership to ensure that there is a shared understanding of disaster response management. During disasters, community members usually assist the victims before the arrival of response organisations. However, they sometimes lack knowledge of DM. According to Skar et al. (2016), training exercises help improve communication and coordination between the different participating actors. This finding is in harmony with that of Wolbers and Boersma (2019) who argue that training closes the gap that exists among different response organisations with varying professional cultures that hinder them from effective interpretation and sharing of disaster knowledge. Another challenge identified was the lack of mutuality because each organisation responds according to their own understanding of DM. This finding concurs with Adem et al. (2018) and Duong and Chong (2020) who noted that different organisations that collaborate during an emergency usually have their own motivation and mission. Related to this finding Prasanna and Haavisto (2018) argue that the values and beliefs that an organisation holds tend

to can hamper the culture and outcome of collaborative practices. Abbas et al. (2018) argues that to address this challenge, there should be combined educational courses offered to all emergency responders.

The current findings align well with those of previous studies that emphasised the role of capacity building in enhancing DM and the response capabilities of organisations and communities (FEMA, 2017; Jhar, 2018; Schakel & Wolbers, 2021; Skar et al., 2016). However, despite the role that capacity building plays, the reviewed literature highlighted some challenges associated with this strategy, such as funding and political commitment for long-term capacity building, particularly in resource-constrained contexts. This finding from prior literature matches perfectly with those of this current study in which insufficient funding was identified as a potential barrier to disaster response (Becerra-Fernandez et al., 2007). With regard to capacity building as a KM strategy, this study focused on training as a way of capacitating the community, CPC members, MPs and other stakeholders. The responders, however, were silent on infrastructure development despite mentioning infrastructure as barrier to effective coordination. Thus, the DCP should also facilitate infrastructure development and KS mechanisms that improve disaster coordination and its response capabilities (Andreassen et al., 2020a; Comfort et al. 2004).

7.4.4 Use of Technologies

From both a theoretical and practical lens, KM theory emphasises the role that IT plays in knowledge creation, capture, storage, analysis and effective KS. The reviewed literature has shown that the use of IT for DM has improved the outcomes of DM through enhanced situational awareness, improved KS and dissemination, streamlined KM processes, increased accessibility and usability of disaster knowledge as well as adaptive and data-driven decision-making (Duong & Chong, 2020; Ganapathy et al., 2019; Jha et al, 2018; Santoro et al., 2018). The need for IT adoption in managing disaster knowledge and improving emergency response is well supported by empirical evidence in various contexts. These studies have consistently pointed out the positive impact of IT on enabling the systematic capture, storage, analysis and sharing of disaster information. This practice has ultimately led to effective coordination and response operations (Andreassen et al., 2020; Haikerwal, 2011; Jhar, 2018; Loop et al., 2008; Oktari et al., 2020; Rohajawati & Akbar, 2021; Tomé et al., 2022).

Previous studies have consistently highlighted the importance that strategic deployment of IT plays in knowledge capturing, storage, analysis and sharing. However, some prior studies

stressed the need for organisations to focus on all three perspectives of KM, i.e., people, processes and technology. They argue that by focusing on technology, the outcomes of the interventions are not as effective. For example Rohajawati and Akbar (2021) posits that for successful implementation of KM, IT should support the needs of the people and processes. This view dovetails with Tomé et al. (2022) who also discovered that a crisis is solved by using both IT and teaching the responders competency in the right processes. These views concur with Edwards (2011) who argues that without thinking about the way people, organisations and IT operate, any implementation of a KM's initiatives are at best risky and at worst doomed to failure. In the same line of reasoning Ganapathy et al. (2019) postulate that people, processes and IT are the three basic elements in KM implementation.

Another factor to be taken into consideration when adopting the use of IT as a KM strategy is the issue of unequal access to IT and the digital divide. Some areas in Zimbabwe are marginalised because access to such infrastructure can be a challenge and creates or increases inequalities in communities. Another challenge is that of integrating IT solutions with existing organisational processes, structures and legacy systems that can lead to issues with user adoption and interoperability (Abbas et al., 2018; Abdeen et al., 2021). Thus, integrating the use of IT as a KM strategy requires the DCP to address the challenges identified.

7.4.5 Engaging in partnerships for KM

The study findings revealed a general consensus that the DCP should have partnerships with various stakeholders, such as the private sector, academia, regional and international organisations to enhance its ability to effectively respond to disaster. This finding is congruent with the theoretical concepts of knowledge networks (Ritala et al., 2023; Vordos et al., 2020). KM theory emphasises the importance of collaboration and KS across organisational boundaries. No single organisation can possess all the necessary knowledge, skills, capabilities and resources to effectively manage disasters. As such there is a need for organisations to engage in partnerships to facilitate the exchange of knowledge and integrate diverse skills, knowledge and perspectives (Dalkir, 2013). This practice enhances collaborative action, shared understanding and collective resilience and, ultimately, the effectiveness of disaster coordination and the response effort. The communication channels and collaborative platforms established through partnerships can facilitate the swift flow of disaster information and also help in leveraging each stakeholder's unique capabilities and resources, leading to effective disaster response efforts.

Various empirical studies have shown the significance of engaging in partnerships for KM in DM and have consistently highlighted the positive impact of KS networks for effective disaster response (Ritala et al., 2023; Vordos et al., 2020). However, the reviewed literature has shown that for partnerships to work organisations need to consider organisational and cultural differences, power dynamics, equitable decision making powers, resource distribution and the alignment of priorities and goals among partners (Ahangama & Prasanna, 2017). The issue of replicability of successful partnership models as the effectiveness of partnerships also may be highly context dependent. Thus, for DCP to effectively utilise the use of partnerships for KM, there is a need to seriously consider the factors highlighted above.

7.4.6 Governance – policies and legislation

The findings from the study revealed that there is a need for robust governance structures that are enabled by legislative frameworks and clear policies. This process helps in facilitating the sharing, integration and application of knowledge among diverse actors. From a theoretical perspective, these findings on the need for clear governance structures anchor on theories on knowledge governance (Fang et al., 2013; Srivastava, 2022). They conform to previous empirical evidence that underscored the need to formalise KM practices by establishing strong governance structures (Duong & Chong, 2020; Jha et al., 2018). Prior research has shown how poor leadership coordination, lack of clear policies and SOPs have hindered the effective flow of knowledge and application during disaster response (Panayiotis et al., 2017). Other empirical studies, however, have demonstrated the value of legislative frameworks that mandate joint training and exercises (Jha et al., 2018) that involve unorganised volunteers in the response operation (Skar et al., 2016). However, some studies have discovered that overly bureaucratic or rigid governance structures can hinder the adaptability and agility required during disaster response (Branda et al., 2018). Thus, there is a need to balance formal governance mechanisms with operational flexibility (Marcum et al., 2012). In alignment with Jha et al. (2018) the findings from the experts reveal that Zimbabwe has developed supportive laws, regulations and policies to support DM. The country has numerous policies in place, however, these lack enforcement. The policies can incentivise organisations to invest in KMS and collaborative platforms (Gerritsen et al., 2013).

7.4.7 Fostering a knowledge culture

From a theoretical lens, the current finding align with key concepts of the knowledge-based culture (Curado & Bontis, 2006; Srivastava, 2022) that focus on cultivating employees' behaviour and mindsets as well as structural arrangements to facilitate KS, integration and application. By fostering a knowledge-oriented culture, the DCP can yield tangible benefits (Schakel & Wolbers, 2021). The findings revealed the importance of effective communication as a cornerstone to disaster response and cautioned against a generic 'one-size-fits-all' communication approach. This finding resonates with Oktari et al. (2020) who posit that communication is crucial in disaster response and effective communication channels and collaborative work practices enable swift dissemination of information. Currently, the DCP is reactive. A proactive culture will allow the DCP to anticipate evolving needs, identify emerging trends and mitigate and respond to evolving situations. As a result, critical decisions will be made on time because the appropriate information will be made available when it is needed (Asamoah et al., 2018). By restructuring the DCP for KM, the DCP can streamline its decision making processes, empower cross functional teams and eliminate silos. Previous studies, however, highlighted that hierarchical, rigid and siloed organisational structures, together with a lack of collaborative mindset, have hindered effective knowledge flows during disaster response (Oh & Han, 2020; Thi Pham, 2019). Conversely, reviewed literature has also shown how organisations that foster cross-functional teams, open communication and a proactive orientation towards learning have been successful in leveraging knowledge (Edmonstone, 2018). The current study, therefore, reinforces that these prior empirical observations underscore the need for DCP to foster a knowledge culture. However, some studies found out that developing a knowledge culture can be challenging, especially in hierarchical, risk averse and siloed public sector organisations. Resistance to change, entrenched work practices and political dynamics may hinder the structural and cultural changes required (Andreassen et al., 2019).

7.5 Chapter summary

This chapter presented key findings from the study. The study used a qualitative approach and the findings from a diverse range of responders were discussed. Triangulation allowed for addressing a wider range of needs from the various stakeholders. The chapter initially discussed the findings on the current coordination and collaboration practices employed by the DCP. The next section explored the potential barriers to effective disaster response. Thirdly, the identified challenges were discussed in relation to a proposed set of KM strategies.

CHAPTER EIGHT

FRAMEWORK DEVELOPMENT AND VALIDATION

8.1 Introduction

This chapter builts upon the previous chapter that identified the current DCP's coordination mechanism as well as the key barriers to effective coordination and collaboration. In Chapter 4, section 4.5, a conceptual framework was proposed following a comprehensive literature review. This chapter attempts to determine the components of a KM framework and discusses the development and validation of a KM framework for improving crisis response in Zimbabwe. The outline of the chapter is presented in Figure 8.1 below.



Source: Author

8.2 Framework development

8.2.1 Introduction

The main purpose of the KM Framework is to improve disaster coordination and collaboration in Zimbabwe by enhancing DCP's ability to effectively manage and leverage critical KA during

disaster response and management efforts. Tables 8.1 to 8.3 highlight the critical barriers (identified in chapter 6) that hinder effective coordination at DCP and how these are translated into objectives of the KM framework. It also highlights how the progress towards achieving these objectives will be tracked and assessed.

Coordination	Disaster information is siloed and spread across various databases		
Challenge 1	because the DCP is weak in disaster knowledge capture and acquisition.		
	The DCP has an undocumented knowledge culture.		
KM Framework	To improve DCP's ability to capture and retain disaster knowledge.		
Objective 1			
Performance	1. Establish a centralised disaster knowledge repository (KMS) that		
Metrics	documents lessons learned and best practices from past disaster		
	responses. [The number of entries and timelines to be agreed		
	upon implementation].		
	2. Set or increase the percentage of DROs who actively contribute		
	to the centralised repository. [Percentage and timelines to be		
	agreed upon implementation].		
	3. Set or increase data ingestion rate from the various sensors.		
	[Rate and timelines to be agreed upon implementation].		

Table 8.	1	: KM	framework	objective '	1
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Table 8. 2 : KM framework objective 2

Coordination	DROs find it difficult to access information that they need from the DCP		
Challenge 2	to allow them to make sound decisions during disasters. There is		
	knowledge hoarding, a reactive and competing culture and inter-cluster		
	siloes.		
KM Framework	The framework should foster a KS culture and mindset among the		
Objective 2	responders and, thus, enhance KS and cross-agency collaboration.		
Performance	<i>1.</i> Implement KS initiatives such as CoP, training programmes etc.		
Metrics	[Number of initiatives and timelines to be agreed upon		
	implementation].		
	2. Set or increase the number of joint information sharing		

3.	Reduce the average time it takes to share critical disaster
	information across agencies [Percentage and timelines to be
	agreed upon implementation].

Table 8. 3 KM framework objective 3

Coordination	The DCP's culture has been described as reactive due to a lack of		
Challenge 3	information, knowledge and other resources.		
KM Framework	Improve evidence-based decision-making during emergencies		
Objective 3			
Performance	1. Reduce the average time it takes for decision makers to access		
Metrics	relevant information from the repository. [Percentage and		
	timelines to be agreed upon implementation].		
	2. Increase the percentage of disaster response decisions that are		
	informed by data from the repository such as lessons learned and		
	best practices. [Percentage and timelines to be agreed upon		
	implementation].		

8.2.2 Theoretical foundations

To provide a robust conceptual foundation, the KM framework is grounded in the Structuration Theory, Actor Network Theory and the 7S model to inform the underlying challenges and dynamics within DCP's coordination mechanisms. These theories and model were used to gain an in depth understanding of the root causes of the identified coordination challenges. They were used to explore how structural conditions, human and non-human actants and organisational misalignments contribute to disaster coordination breakdowns in DCP as in section 6.6.

8.2.3 KM framework constructs

Chapter 6 section 6.7 summarised the findings and how they informed the development of the framework. Based on an analysis of the findings, the key constructs that guided the development of the framework were presented in Table 6.2 in chapter 6. The constructs are structure, capacity building, governance and compliance, monitoring and evaluation and continuous improvement,

knowledge capture and acquisition, knowledge dissemination, knowledge identification, knowledge sharing and collaboration, leadership, collaborative governance, change management and communication. The starting point for the development of the framework was the identification of challenges from the findings. These challenges highlight DCP's problems and knowledge gaps that the framework needs to address. The challenges serve as the foundation, providing insights into the recommendations and areas in which KM strategies, initiatives and practices can be leveraged to improve disaster coordination and response. These recommendations, in turn, informed the selection of appropriate KM framework constructs. The KM constructs are directly aligned with the recommendations resulting in a framework that provides targeted solutions to DCP's challenges and, ultimately, enhancing the overall coordination.

8.2.4 Knowledge management framework constructs integration

For effective implementation of the KM framework, the framework constructs identified above need to be integrated into a cohesive system. The KM framework comprises several core constructs that are grouped into five broad categories namely: KM processes, IT infrastructure, supporting structures, extraneous variables and the expected outcomes. These constructs are inter related as explained in the sections below:

8.2.4.1 KM processes

The framework's main focus is on improving disaster response through effective disaster KM. The framework incorporates a systematic approach to disaster knowledge identification, capture and acquisition, disaster knowledge storage and retrieval, disaster knowledge transfer sharing, dissemination and collaboration. This creates a disaster knowledge infrastructure that can be used to improve the proactiveness of the disaster coordinating organ, efficient resource allocation and decision making and, hence, the overall effectiveness of the response operation.

8.2.4.2 Technological infrastructure

However, the successful implementation of the KM processes listed above depends on the availability of a robust IT infrastructure. The KM framework leverages a suite of technologies and technological solutions. At the core of this framework is the development of a centralised

knowledge repository that will serve as the platform and backbone for knowledge storage, retrieval, data analytics and collaboration. This resource is clearly highlighted on the word cloud created from ATLAS.ti.24 in Chapter 6, Figure 6.7. Findings from the study stress the need for the development of a comprehensive Knowledge Management System (KMS) that serves as a centralised, secure and scalable platform that enables disaster data collection and acquisition, storage, analysis dissemination and transfer of disaster-related information and knowledge. This platform should act as a source for evidence-based decision-making for all disaster response stakeholders. The platform should also capture lessons learnt from previous disasters and any other relevant disaster-related information. The diverse data and information should be seamlessly aggregated and consolidated into a centralised disaster knowledge repository that acts as the primary storage and management system. The KMS should employ a multi-faceted approach to data acquisition and capturing and should integrate real-time inputs from various sources and employ multilingual capabilities. The KMS should incorporate advanced data mining and analytical capabilities to allow for the extraction of meaningful insights and patterns from the data to assist stakeholders in making data-driven decisions regarding disaster preparedness and response.

To present the relevant disaster related information and knowledge to the right stakeholders at the right time in the right format, the KMS should adopt the use of data visualisation tools. The dashboard should be customisable, allowing different stakeholders to tailor it to their specific requirements enabling data-driven decision-making during disaster preparedness, response and recovery. This KMS should integrate easily accessible and secure collaborative platforms to ensure effective collaboration and information sharing among the various stakeholders. The collaborative platforms should facilitate the co-creation of disaster related knowledge, resource coordination, joint planning, collective decision making and the fostering of a KS culture. To ensure the availability, integrity, confidentiality, quality, currency and consistency of the stored knowledge assets, the KMS should incorporate version control mechanisms, cybersecurity measures and robust data governance frameworks. This KMS should be scalable and adaptable, allowing for easy integration of new data sources and adaptation to evolving disaster response requirements. The section below describes the individual components of the KMS.

Knowledge identification, capture and acquisition: The framework focuses on the development of a centralised knowledge repository that should:

✓ Be managed at the district, provincial and national level

- ✓ Allow for the capturing, storage and tracking of disaster information at ward, district, provincial and national level.
- ✓ Gather information concerning both anticipated and past disasters, lessons learned, best practices, DM experts, evacuation centres, risks and vulnerabilities each district/ward is prone to, the IK and IK-EW for that ward and any other relevant disaster-related information.
- ✓ Allow for a more localised and granular understanding of disasters at a local level, including the specific impact on the various community groups and the subsequent response efforts.
- Populate the centralised information repository with effective information from various sources using any or a combination of the following:
 - web scraping by extracting relevant information from the various organisations' websites;
 - API and data connectors to enable seamless integration of disaster data from the participating organisations' internal systems, database integration and/or, crowdsourcing,
 - designing a standardised template or data collection form that the various organisations can use to submit their disaster-related data in a consistent format;
 - utilising NLP and ML techniques to identify, extract and classify relevant information from unstructured sources of data.
- ✓ Capture data and information from the communities using the following methods:
 - Deploy mobile data collection platforms such as KOBO collect and ODK that can be used by first responders, community members and volunteers on the ground. These mobile solutions should be integrated with features such as photo/video capture, GPS tracking, and voice recording to facilitate the collection of rich and location-based data. The mobile solutions should ensure offline functionality to enable data capture in areas with disrupted internet connectivity.
 - Deploy a network of sensors and devices throughout the communities to capture real-time data on the various parameters set by the DCP, such as infrastructure status and environmental conditions. These sensors should be integrated with the centralised knowledge repository enabling the flow of data from the community to this repository. The DCP should also consider using satellite imagery, drones and remote sensing technologies if ground-based sensors are affected.

Knowledge storage: The centralised knowledge repository can utilise data lake and/or data warehouse architecture to house the disaster-related data in a structured and unified manner. The following technologies can be used among others:

- ✓ For the data lake: Amazon S3, Azure Data Lake and Apache Hadoop
- ✓ For the data warehouse: Google BigQuery, Snowflake or Amazon Redshift.

The centralised knowledge repository should be structured in a hierarchical and integrated manner at the national, provincial and district levels. The integration of these information sources should be bidirectional allowing for two-way communication between the levels:

- ✓ At the district level: The DCP should establish its disaster knowledge repository that captures data and information specific to their jurisdiction. Each ward should collect information concerning that area, allowing for granularity in data collection. The centralised repository should be equipped with data collection capabilities as discussed above. It should feed into the provincial-level repository through robust and automated data ingestion pipelines, to allow for higher-level analysis and decision-making.
- ✓ Provincial-level repository: This facility should serve as an aggregation point for insights collected from the various districts within a province, ensuring coherence and consistency across the provincial knowledge base. The provincial repository should capture and consolidate information from provincial-level government agencies and other relevant sources that should then feed into the centralised disaster knowledge repository through data pipelines.
- ✓ National-Level repository: This facility should serve as the country's authoritative and primary source for disaster-related information.

Disaster knowledge processing and analysis: The framework leverages:

- ✓ Big data processing frameworks such as Hadoop MapReduce, Apache Spark and/or Azure Databricks to perform large-scale data transformation, processing and analysis.
- Advanced analytics predictive modelling and pattern recognition by integrating ML and AI capabilities.
- ✓ Knowledge-mining techniques like NLP to identify patterns, extract relevant information and uncover hidden relationships from the various unstructured data sources. These techniques will help the DCP identify emerging disaster trends or patterns at the ward level by analysing data from various sources. Patterns such as the distribution and utilisation of emergency resources across different wards within a district will allow the efficient and equitable allocation of resources.

Knowledge transfer, sharing and dissemination: The KMS should:

- ✓ Organise, classify and index the processed information to enable organisations in a particular sector to easily search for and access relevant information.
- Compile a dashboard that displays only information that is relevant to organisations in a particular sector. It should provide advanced data visualisation and dashboard tools such as Power BI, Tableau and Grafana. This process will allow the DROs to quickly access and interpret needed information for prompt decision-making.
- ✓ Integrate collaboration platforms such as Slack, Microsoft Teams or Confluence to enable document sharing, real-time communication and joint decision-making for organisations in the same cluster. The KMS should implement the alerting and notification mechanisms to proactively inform the relevant organisations within a certain cluster of emerging trends, resource needs and critical disaster events.
- ✓ Utilise technologies such as email and SMS.

For knowledge collaboration:

- ✓ The KMS should provide collaborative features such as discussion forums, shared workspaces and file sharing capabilities to ensure effective collaboration and knowledge sharing among responders. Among the information to be stored in the centralised repository should be partnership information. The KMS should allow for easy access and retrieval of partnership related information for all stakeholders. The KMS can act as institutional memory, accumulating lessons learned and knowledge from past and ongoing partnerships. The system should have functionalities to monitor and track KPIs and metrics related to the partnerships, such as deliverables, financial data and project milestones.
- ✓ Zimbabwe should establish strategic partnerships with international organisations, including UN bodies such as the WFP and UN Habitant for sourcing skills and financial resources. This practice will ease the current challenge of obtaining the necessary resources. However, Zimbabwe's Disaster Risk Reduction practices should adhere to internationally recognised and accredited standards.
- ✓ The DCP should partner with various stakeholders, such as academia, to capacitate knowledge generation. Research studies regarding each ward's IK, risks and vulnerabilities, knowledge needs, availability of PwD and informational needs should be conducted in collaboration with Zimbabwe's Higher and Tertiary education institutions. Research studies relating to the root causes of any instances of conflict or competition

among responders should be instigated so as to develop or refine DCP's collaborative governance framework.

- ✓ The partnerships should also focus on the capacity building of the various stakeholders. Experts in the various disciplines should offer capacity building sessions in collaboration with the DCP, relevant ministries and partner organisations.
- ✓ The DCP should also partner with relevant ministries, such as the Meteorological Department, and the communities for designing and deploying IK-based EWS that can disseminate disaster alerts specific to a particular area.

8.2.4.3 Supporting structures

If the KM processes are supported solely by technological solutions it will not result in a sustained utilisation of the framework and, hence, effective disaster response. There is a need for an enabling environment. The successful implementation of the KM framework requires supporting structures beyond the technological component. The following constructs are important for successful KM framework adoption and utilisation:

Structure: The CP structure in Zimbabwe needs reconsideration. As long as the CP structure is centralised, implementing the KM processes, even if supported by technology, will not yield the desired results. The centralised CP structure presents barriers to managing and coordinating disaster knowledge. A hybrid approach should be adopted. This structure entails centralised decision-making at the national level and autonomy at the district level to allow for the addressing the specific needs and disparate circumstances of the different areas. The national level will be responsible for setting overarching policies, guidelines and strategies for disaster preparedness, response and recovery. It will be responsible for managing cross-jurisdictional disasters, coordinating national-level resources, and ensuring the enforcement of DM standards and protocols across the country. One of the main duties will involve aggregating and analysing data from the districts and provinces in Zimbabwe to inform national-level planning and resource allocation. To facilitate decentralised decision-making, the DCP at the district level will have autonomy in making decisions and implementing measures that address the specific needs of their respective districts. This hybrid approach requires the setting up of DCP offices (EOCs) at the provincial and district levels staffed by people solely responsible for CP issues. The role of the EOC will be to collect, analyse and generate actionable insights from disaster data generated at the local level, thus, catering for microclimatic conditions. The DCP should then strengthen

structures at the ward and village levels to allow for the capturing of localised disaster-related information. It should identify and engage a team of volunteers who are familiar with local conditions and IK in each village. These people will act as information sources, providing a clear picture of the ward risks and vulnerabilities. Decentralisation, thus, will allow for more responsive and agile decision making resulting in more effective disaster response. The organisational structure also has to be modified to include knowledge-related posts such as chief knowledge officers, data engineers, data analysts, training coordinators, OL specialists, knowledge curator and knowledge brokers that will address the DCP's knowledge-related requirements.

Leadership: In order to effect adoption and utilisation of the KM framework, strong leadership is a requirement for:

- ✓ Ensuring the sharing of the DCP's disaster coordinating vision, establishing and setting priorities, avoiding responders behaving autonomously during response operations.
- ✓ Ensuring the enforcement of policies and regulations and implementing and adhering to monitoring and evaluation metrics.
- ✓ Fostering a knowledge culture comprising trust, accountability, collaboration and disaster information sharing rather than a competing culture, through which members will take ownership of their tasks and responsibilities. This culture should utilise knowledge and adopt a proactive rather than reactive stance. They should mobilise resources before a disaster strikes or at least ensure availability of the minimum threshold of resources.
- ✓ Implementing conflict resolution mechanisms to ensure a healthy disaster response environment.
- ✓ Implementing robust governance structures and proactively mobilising resources before a disaster occurs.

Change management and communication: For an effective transition from manual DM to knowledge-based DM, the DCP needs to embark on several activities in order to manage the change. These include:

- ✓ Setting up district emergency operating centres (DEOCs).
- ✓ Identifing key stakeholders within the DROs, CPCs and experts and conduct a study to understand their concerns, needs and expectations regarding the centralisd knowledge repository. Stakeholders should be involved in the design, development and implementation of this repository. This practice fosters a sense of ownership and increases the chances of adoption once the process is deployed.

- ✓ The DCP, through its leadership, should develop a communication plan to educate the DROs, communities and all other stakeholders on the benefits of the centralised knowledge repository and its features. This plan can comprise a variety of communication channels and training sessions. The DCP can also develop targeted training programmes to educate stakeholders how to effectively use the knowledge repository
- ✓ To ensure the stakeholders utilise the centralised knowledge system, the DCP should develop a system of recognition to reward those who contribute to and/or use the repository.
- ✓ As part of its communication role, the local DCPs should oversee the development of culturally appropriate disaster-related information that is accurately translated into the local dialects and minority languages of prospective users. These translations should take cognizance of the terminology and nuances of the different local language dialects.
- ✓ As part of its communication role, the local DCP should ensure inclusive communication that respects the needs of people living with disabilities (PwD). Organisations should ensure that disaster-related resources are created in a format that is accessible, including sign language interpretation and text-to-speech.

Capacity building: Implementing the KM Framework requires knowledgeable staff who are aware of the following criteria:

Who should be capacitated and why?: All DROs, stakeholders and communities to ensure a unified approach, shared understanding and vision of disaster response priorities in order to acquire specialised DM and response knowledge, engage in collective action and problem-solving and avoid political expediency,

Capacitated on what? Training should focus on:

- ✓ The technical competencies to navigate the central knowledge repository how to effectively access, use, contribute to and leverage the available knowledge across the different sectors.
- ✓ Change management strategies to help members adapt to the new system and processes.
- ✓ How to carry out AARs effectively and foster a culture of continuous learning

How to capacitate?: This can achieved through:

✓ Engaging stakeholders in training, workshops, seminars, simulation exercises, collaborative decision making, effective communication channels and other KS activities.

- ✓ Implementing educational and outreach programmes for communities, including marginalized groups, to encourage them to solve their challenges, identify and address the underlying political and social tensions.
- ✓ Implementing open dialogue and consensus-building workshops.
- Introducing mentoring programmes through which disaster knowledge is transferred from more knowledgeable to less-well informed members.
- ✓ Rotating the sector representatives' attendance of CPC meetings.

Governance and compliance: Without strong governance mechanisms in place, the KM processes will be undermined. DM authorities and policymakers should prioritise the development of these governance frameworks through introducing:

- ✓ Legislation to mandate the acquisition, storage and sharing of critical KA.
- ✓ Legislation, policies and SoPs to obligate organisations to implement standardised information protocols, participate in knowledge networks and regularly update their response plans based on lessons learned, involve impartial volunteers in the response operation and include every stakeholder in the disaster response.
- ✓ Legislation to motivate and provide legal protection and funding mechanisms to support the adoption of the KM tools and collaborative platforms across sectors and agencies.
- ✓ Strong governance mechanisms to clarify ownership, accountability and responsibility that promotes a culture of KS.
- ✓ Strong governance mechanisms that forbids political interference in disaster information dissemination.
- ✓ A collaborative governance framework that defines who leads in the event of a certain type of disaster, the responsibilities, roles and decision-making processes for participating organisations.
- Monitoring and evaluation mechanisms to hold DRO organisations accountable for their roles and responsibilities.
- ✓ SoPs for disaster response activities and MoUs that ensure everyone understands their terms of operation.
- ✓ DCP mechanisms to document key members' knowledge, best practices and experience and ensure that the relevant information, lessons learned and best practices are accessible to responders during disaster response efforts.

Monitoring, evaluation and continuous improvement: To ensure continuous improvement, the DCP should conduct comprehensive AARs after major disasters that include the employment of diverse stakeholder to capture best practices and lessons learned. The AAR should also focus on challenges that the stakeholders encounter in accessing, interpreting and applying the relevant information, as well as the effectiveness of the knowledge-sharing processes. The DCP should then utilise the insights gained through the AARs to inform the continuous improvement of the KM framework. The DCP also needs to ensure the long-term maintenance and sustainability of the technological solutions in the face of the ever-changing technological/IT landscape, in a developing country context in which resources are limited. The DCP should put in place monitoring and evaluation mechanisms to hold DRO organisations accountable for their roles and responsibilities

8.2.4.4 Extraneous variables

For effective overall disaster response using the KM framework, it is important to identify factors that are not directly related to the KM processes and are beyond the DCP's control but can influence the effectiveness of the DCP's response effort. Researchers and practitioners should possess an in-depth understanding of these factors so that they incorporate them in strategies to mitigate the impact of these extraneous variables. The findings from this study revealed the following extraneous variables: regulatory and legal frameworks, political landscape, social and cultural norms within communities, technological challenges and differences in organisations that can include culture, leadership and resource constraints.

8.2.4.5 Expected outcomes and benefits

The disaster KM framework improves the DCP's ability to capture and retain disaster knowledge, fosters a KS culture and mindset among the responders in Zimbabwe and, thus, enhance cross-agency collaboration. Ultimately, it augments the capacity of the DCP, DROs, stakeholders and communities and increases evidence-based decision-making during emergencies. The framework supports data-driven decision making. By implementing this process, the following outcomes and benefits are expected:

- i. Improved disaster preparedness and response.
- ii. Enhanced organisational learning and continuous improvement.
- iii. Greater collaboration and knowledge-sharing.

- iv. Improved resource allocation and optimisation.
- v. Increased community resilience and engagement.
- vi. Enhanced monitoring, evaluation and continuous improvement.
- vii. Improved overall disaster response and coordination in Zimbabwe.
- viii. Greater success in saving lives and property.

8.2.4.6 Visualising the disaster knowledge management framework

Figure 8. 2 below shows the key constructs of the disaster KM framework and how they fit together.



Figure 8. 2: Proposed disaster KM framework

8.2.5 Framework evaluation

The disaster KM framework should be evaluated periodically for effectiveness, relevance and alignment with the DCP's strategic objectives. Key performance indicators (KPIs) and their supporting metrics should be established for systematically assessing the framework's capability to produce the outcomes stated in section 8.2.4.5 above. The evaluation process should include the analysis of the framework's alignment with the overall DCP's strategic goals, its ability to capture and disseminate disaster knowledge, allow stakeholders access and utilisation of the knowledge, indicate the extent to which the framework supports OL, the satisfaction and engagement level of users as well as the overall impact, cost-effectiveness and sustainability of the framework. The insights gained from such an evaluation will then inform the continuous refinement and optimisation of the disaster KM framework. This process will enable the DCP to use the evidence-based KM approach, allowing it to adaptively respond to evolving DM challenges. The factors that can be measured using both quantitative and qualitative approaches are indicated below.

- 1. The disaster KM framework's alignment with DCP's overall strategic objectives.
- 2. The DCP's use of the centralised knowledge repository to capture and share disaster knowledge.
- 3. How frequently disaster stakeholders access and utilise the centralised knowledge repository
- 4. The KM framework's support of organisational learning and adaptation.
- 5. The disaster stakeholders' satisfaction and engagement.
- 6. The impact of the KM framework on disaster response outcomes.
- 7. The cost effectiveness and sustainability of the KM framework.

Table 8. 5 below shows the KPIs, their description and the metrics that can be used in measuring the respective indicator.

Key F	Performance	Description	Metrics
Indicator			
Ability to capture and share		Number of KA (lessons learnt,	Number of KA captured
disaster knowledge		reports, best practices, etc.)	

Table 8. 4: KM framework KPIs and metrics

		Number of KA added per
		given agreed period
		Percentage of KA shared with
		stakeholders per given
		agreed period
	Diversity and frequency of KS	Number of KS events per
	initiatives	given period
		Number of stakeholder
		groups attending the event
		per given time
	User engagement and	Number of downloads
	participation in KS activities	Feedback from users
Ability of stakeholders to	Ease of access and	Time taken to locate relevant
access and utilise the	searchability of the repository	knowledge assets.
knowledge in the repository		
Support of KM framework to	Integration of lessons learned	Number of lessons learned
OL and adaptation	from past disasters	documented and shared
Stakeholder satisfaction and	User satisfaction with KM	User satisfaction surveys
engagement	framework	
	KMS adoption and utilisation	Number of active users per
	rates	given time
impact of the KM framework	Response times during disaster	Average response time for
on disaster response	events	critical disaster response
outcomes		activities
	Resource utilisation and	Cost savings
	efficiency	
Cost effectiveness and	Total cost of ownership and	Total KMS implementation
sustainability of the KM	return on investment	cost
framework		

8.2.6 Framework implementation approach

To ensure effective deployment and long-term sustainability, the implementation of this KM framework should be guided by a well-defined project management methodology. It requires a structured and multi-phased approach that involves key stakeholders throughout the phases. It is important to highlight that this framework acts as a general guide since it involves stakeholders at national, provincial and district level. On actual implementation, the researcher recommends carrying out the same study but with stakeholders within the same district to allow for context specific scenarios. The following phases are recommended, however, some of the stages can be implemented concurrently and they not necessarily in any chronological order. Timelines will be agreed on implementation.

Step 1: Seeking political will and leadership buy-in. This step involves actively seeking support in the implementation of the KM framework. The framework should be presented to the Minister of the MLGPWNH and other influential leaders, decision-makers and key stakeholders. The researcher will use a multi-pronged approach to disseminate the findings from her research specifically the KM framework. Targeted presentations can be undertaken through which she can make presentations to government officials, ministers, ministry representatives and other influential leaders. In addition, the researcher can also prepare policy briefs that highlight the coordination challenges, the proposed KM framework and the evidence-based benefits of implementation and these briefs can be distributed to influential leaders. The researcher can also leverage stakeholder workshops hosted by the DCP with the various DROs. She can use these forums to facilitate discussions concerning the value of the framework. Lastly, the findings can be published in peer-reviewed academic journals and the researcher can present the research results at relevant conferences and workshops to engage a wider audience of experts and decision makers. The KM framework should align with the goals of CP in Zimbabwe and public policy goals related to disaster response, preparedness and management. The purpose of these engagements include attaining the support and endorsement of influential leaders, political figures and policy makers who have the power to allocate the resources towards the implementation of the KM framework, as well as driving the changes required for the KM framework's success.

Step 2: Governance and oversight

After gathering political will, the next step is for the political leaders, influential leaders, experts and all the stakeholders included in Step 1 to form a steering committee. The leaders will select
and appoint members to this committee that should comprise key stakeholder groups, including government authorities, NGOS, community leaders, emergency services and all other stakeholders involved in disaster response. This steering committee should be responsible for spearheading the implementation of the KM framework, including securing resources, both human and financial, to support the implementation of the framework. The committee will also be responsible for maintaining stakeholder engagement and monitoring and evaluating the framework. This committee should act as the primary sponsor and advocate for the KM framework, promoting its adoption. Thus, the committee will define its own mandate, scope, objectives, roles, responsibilities and decision-making authority, together with a comprehensive governance framework including policies, guidelines and procedures for the KMS usage, data management, access controls and maintenance.

Step 3 : Needs assessment and gap analysis

The steering committee should spearhead a comprehensive needs assessment process. This inclusive approach is necessary throughout the development and implementation of the KMS to develop an effective system that addresses the needs of its users. This process will increase the chances of developing a system that will be adopted and used effectively because the stakeholders will have a sense of ownership and commitment towards the system. The community, as well as other stakeholders, should be included in need assessment process to ensure that the KM system supports grassroots level disaster response efforts. Thus, the leadership of the steering committee should ensure that a thorough assessment of DCP's current DM and knowledge and information ecosystem for each district. The population for this study includes the DCP itself, DROs, subject matter experts, traditional leaders, communities, CPC members, government ministries and agencies, and all the relevant cross-functional stakeholders involved in disaster response that are represented in each district. Engage with these stakeholders to gather their informational and knowledge needs to support their roles and responsibilities during disasters. Identify the critical KA for the type of disaster and evaluate the accessibility, usability and timeliness of the critical KA for DM personnel. Analyse the tools, systems and channels currently used by the various stakeholders in communicating with the DCP for accessing, sharing and disseminating disaster information. This process includes evaluating information on various stakeholders' websites. Identify inefficiencies, challenges and knowledge gaps. Investigate the stakeholders' envisioned future. Evaluate disaster knowledge flows and sharing mechanisms by analysing how disaster knowledge is acquired, created, shared and utilised within the DCP and across relevant stakeholders. Identify barriers and bottlenecks to

effective coordination and collaboration across Zimbabwe's ten provinces and 63 districts. To ensure collaboration and reduced costs, the DCP can enter into partnerships through MoUs with various stakeholders, including universities. In Zimbabwe, the current Education 5.0's community engagement pillars challenge universities to engage in community activities to address real world challenges affecting local communities. Thus, the DCP can partner with institutions of higher learning in each province for carrying out research studies. Researchers, DM experts' and other sector specific experts from these institutions can work closely with the PCPCs in each province. A phased approach can be used in each project whereby the assessments are conducted in phases, starting with selected districts. The various districts within a province will be consolidated to create the provincial outlook that will be consolidated to formulate the national plan. The expected deliverables include:

- i. A comprehensive KA inventory comprising owners, location and characteristics,
- ii. A knowledge-needs assessment report,
- iii. Knowledge flow mapping,
- iv. Stakeholder mapping,
- v. A KM capability assessment and
- vi. A KM strategic roadmap that outlines the specific resources, initiatives and timelines to address the identified KM needs that are aligned with the DCP's disaster response objectives.

Step 4 : Capacity building

Based on the knowledge needs assessment undertaken in STEP 3 above, a tailored training programme should be developed and delivered to build the capacities of the identified stakeholders. This exercise should be a collaborative effort that involves bringing in subject matter experts from various fields, capacity building partners (including academic institutions and training organisations) and community-based organisations that should assist in capacitating the communities. These stakeholders should collaboratively deliver the training to the various stakeholders and, in this way, increase the capacity of government agencies, humanitarian organisations, private sector entities and community leaders. The training should cover aspects such as how to contribute, access and utilise the information and knowledge shared through the KMS. Capacity building also includes organisational capacity building, during which experts will assist participating organisations to strengthen their internal processes and also facilitate collaboration among stakeholders.

Step 5 : Establishing district-level EOCs and implementing manual KM processes

A hybrid approach was recommended in this study in which decentralisation existed at the district level and centralisation at the national level. To implement total decentralisation, there is a need at the district level for the setting up of EOCs close to the affected community, to ensure local disaster knowledge is captured, collected, processed and disseminated amongst the stakeholders in a timely and targeted manner. The DCP should engaged the relevant staff to work in the EOC, and recruit volunteers within the communities to assist with data collection. Before implementing the IT/technology-driven solution, the EOC staff members should have a solid understanding of the KM processes. This knowledge should possess a clear understanding of how disaster data is acquired using manual processes so as to develop a foundation for later integration with technology solutions. Thus, the key activities for this phase involve:

- i. Recruitment of EOC staff,
- ii. Setting up physical infrastructure for the EOC,
- iii. SoP development for the manual disaster data and information and knowledge processes,
- iv. Capacity building for the EOC staff,
- v. Implementing systems and mechanisms for disaster data collection and collating from the various sources and
- vi. Establishing mechanisms for disaster information sharing, transfer and dissemination.

Step 6: Development and implementation of the KMS

Suggest the technological requirements based on the information and knowledge gaps identified from the stakeholder consultations held during phase1, and reviewed findings from the manual KM processes conducted during in phase 2. Use the information to design the core components of the KMS architecture and determine the information sources, storage and retrieval mechanisms as well as KS channels required. To ensure the integrity and accessibility of the system, establish data governance frameworks. Based on the requirements, select the appropriate technologies to support the KMS and implement robust KM process capabilities. Use a phased rollout plan for deploying the KMS across the DCP and its stakeholders. For seamless transfer of historical data, develop data migration strategies. Establish KM champions within the organisation and deliver training for DCP stakeholders and users of the system

Step 7: Governance and monitoring

The DCP should put governance structures and policies in place.

8.3 Framework validation

To ensure the effectiveness and robustness of the KM framework, the researcher used expert evaluation approach to validate the framework. The researcher selected experts with extensive experience and domain knowledge in the field of KM, DM and IT. These experts were selected because of their thorough understanding of the emerging trends, challenges and best practices in their domains. Six domain experts were identified, two from each domain. The researcher first emailed the experts the framework and then organised review sessions that were attended virtually. The experts assessed the feasibility, conceptual soundness and potential effectiveness in addressing the challenges identified in the study. The experts provided valuable insights, feedback and recommendations to refine the framework that included:

- Incorporating extra governance mechanisms to ensure long-term sustainability of the framework considering a resource constrained nation. Experts recommended mechanisms to sell disaster related data to those that need it to ensure there are funds to maintain the system (the issue of sustainability).
- The need to evaluate the technical feasibility of the framework given the digital literacy levels of target user groups, existing infrastructure and the limited availability of financial resources to invest in such a framework,
- The feasibility of the framework considering the political position in which disaster information sometimes is withheld until it is confirmed at the national level.

The refined framework was further subjected to experts' scrutiny and this process helped validate the framework. The framework offers a valuable starting point for enhancing disaster response coordination globally, but its successful application will depend on careful consideration of local dynamics and specific needs in each country.

8.4 Chapter summary

This chapter has focused on developing the disaster KM framework, the objectives of the KM framework, the key constructs that guide the development of the framework and how the constructs will be integrated. The chapter also examined how the framework will be implemented and evaluated. The chapter ended with a discussion on how the framework was validated.

CHAPTER NINE

CONCLUSIONS, CONTRIBUTIONS AND LIMITATIONS

9.1 Introduction

This chapter presents a summary of the entire research from Chapter One to Chapter Nine and the contribution of each chapter to the whole study. Furthermore, it presents the conclusions drawn from the findings and the results of the study. The novel contributions of this study will also be discussed, including theoretical, practical and methodological aspects. Next, the limitations encountered in the study will be presented. This is followed by a discussion of areas that future researchers should focus on and lastly, a summary of the study findings is presented. Figure 9.1 below shows the structure of this chapter.



Figure 9. 1: Chapter outline

9.2 Conclusions

9.2.1 Current coordination mechanisms and collaboration practices employed by DCP in emergency response.

The conclusions drawn from this objective are that the DCP leverages the various structures, systems, processes and methods of emergency response. There exists a sound institutional

framework for CP. The structure is clearly defined, uses a multi sector approach, receives funding from the government and also pooled from various organisations. In terms of disaster information flow, the DCP has an established a two-way communication channel. This practice signifies an open and collaborative information-sharing environment, that is a positive sign. However, the DCP may not fully maximise the benefits of data-driven decision-making due to its weakness in data collection and acquisition. It can be concluded that DCP's KM practices are not optimised to support decision-making and continuous improvement. For DCP to harness the power of effective information flow, it should focus on strengthening its data, information and knowledge acquisition, analysis and utilisation capabilities to complement its existing communication channels. In terms of disaster KM, the DCP depends on partners for data collection, this process can result in delays, gaps or misalignment of the information available to guide decision-making. DDC does not have sub-offices situated close to communities and, consequently, information transmission is slow, thus, increasing the probability of misinformation. There is no central repository of disaster-related information at all levels. There are also no disaster information-sharing platforms under the purview of DCP. Information is siloed and is spread across multiple databases, hence, there is no central source from which one can find and access all the required information simultaneously. For interagency-coordination, the following committees play a significant role in ensuring the sharing of disaster-related information in Zimbabwe, however, there is a gap in inter-cluster communication. The DCP offers training programmes for both the community and its partners, however, most of these initiatives are funded by the partners and training is undertaken in collaboration with hazard experts. The DCP itself lacks adequate funding to initiate training programmes. This deficiency undermines the distribution of skills and knowledge among all stakeholders and, ultimately, the overall effectiveness of disaster response in Zimbabwe. It can be concluded that it is not clear whether the ICS is used as a mechanism. If used, ICS is mostly utilised during simulations. The lack of a common understanding and consistent application of the ICS, as well as the perceived limitations of the system, could hinder the coordination, informationsharing and overall effectiveness of Zimbabwe's disaster response efforts.

The disconnect between the findings on MoU processes implies that there is a need to either streamline the practice to ensure it is accepted as being necessary when working in an affected community, or there is a need for greater transparency to ensure a more coordinated system that prioritises the affected people. It can be concluded that DCP may not have a comprehensive or well-established SoP system in place, leading to inconsistent application across responders. If the SoPs do exist, there are likely issues concerning their communication, adoption and

enforcement across all responders. This situation might be the reason why there was a lack of consensus among the respondents regarding this issue. A major conclusion drawn from these findings is that the DCP should review its SoP development and implementation process and ensure training, clear communication and enforcement mechanisms are put in place to promote consistent use of response practices across all responders. The DCP may be attempting to carry out AARs and debriefing exercises, however, there are some gaps in the way that these are conducted, the results stored and made use of in future. The lessons learned from previous disasters are rarely shared with those that need them. The DCP, therefore, needs to review and strengthen its AAR and KM processes to ensure effective implementation of these in a way that drives organisational learning.

9.2.2 Potential barriers to effective coordination and collaboration amongst the emergency responders.

The major conclusion drawn from this study is that in addition to the CP structure being a good coordination mechanism, it also acts as barrier to effective disaster response. The structure is centralised that operates well for national level communication but presents challenges at the district and local levels when disasters strike. There, therefore is a need for a hybrid approach in which decentralisation occurs at the district level. Disaster communication lacks a communication infrastructure, the communication is too bureaucratic, also exclusive and does not take into consideration politics take centre stage. There is low government uptake and the lack of resources hinders effective disaster coordination. The DCP over-relies on partners who often compete with each other while political expediency and an insular and reactive culture result in knowledge hoarding. All these factors hinder the effectiveness of the disaster coordinating organ. There is therefore a need to address these problems.

9.2.3 KM strategies for effective coordination and collaboration among emergency responders in Zimbabwe.

The major conclusion drawn from this study is that there is a need for a centralised disaster knowledge repository that should act as a central hub for accessing and disseminating all disaster related information. The DCP also needs to invest in IK-based EWS as well as capacity building for its staff, partners and communities. The DCP should also invest in IT to facilitate the gathering, storage, analysis and efficient dissemination of accurate disaster information. It should engage in partnerships for KM, review and strengthen its governance framework and also foster a knowledge culture.

9.2.4 KM framework for improving coordination and collaboration among emergency responders.

A disaster KM framework was developed based on a robust IT infrastructure to support knowledge acquisition, storage, analysis dissemination and sharing. It also hinges on a complementary supporting system including structure, leadership, change management, communication, capacity building, governance and compliance as well as monitoring and evaluation. There is also a need for the DCP to take into consideration some extraneous factors such as the regulatory and legal framework, political landscape, social and cultural norms, technological challenges, resource constraints and differences between and within organisations. This KM framework can serve as a valuable model for improving emergency and crisis response in Zimbabwe.

9.2.5 Proposed KM framework validation.

Expert evaluations were used to validate the proposed KM framework

9.3 Contributions

9.3.1 Practical contribution

This research study provides practical guidance and actionable recommendations for the DCP, disaster response organisations and government. The proposed KM framework serves as a valuable tool for improving emergency and crisis response in Zimbabwe through enhanced knowledge capture, storage and sharing.

9.3.2 Methodological contribution

This study used the Actor Network Theory, Structuration Theory and the 7S Model as both theoretical and analytical frameworks. Integrating the three concepts provided a multifaceted and comprehensive lens through which to examine the complex dynamics of disaster response and knowledge management, hence bridging practical and theoretical perspectives. Triangulation of the various sources also strengthened the validity and reliability of the research findings, ultimately contributing to the development of a well-grounded KM framework for improving disaster response in Zimbabwe.

9.4 Limitations

The framework however has the following limitations:

i. Although the research was inspired by the cyclone IDAI disaster, the framework focused on general disaster response with multiple stakeholders. Future studies should focus on specific disasters such as fire, drought, transportation (e.g. road accidents) or epidemics (outbreaks of infectious diseases). The developing of a customised KM framework that focuses on a specific type of disaster, such as drought or an infectious disease, e.g. COVID-19, is important because different types of disasters have unique characteristics, with exceptional knowledge needs, resource needs and best practices. There are primary and secondary responders for each type of disaster, and as such, a customised KM framework will facilitate coordination among the relevant stakeholders. This specialised method will allow for a tailored approach, more efficient information sharing, coordination and response, decision making and resource allocation during the response and recovery phase.

9.5 Suggested areas for further studies

These can be grouped under the following subheadings:

Knowledge capture and acquisition: Future researchers can develop a disaster data integration framework that is capable of consolidating disaster knowledge from heterogeneous sources into a centralised repository. Data Science researchers may focus on developing and validating algorithms for data extraction, cleansing and normalisation to allow for seamless integration of structured and unstructured data into the centralised disaster knowledge repository. They may also research real-time or near real-time data ingestion and incremental updates to ensure that the centralised disaster knowledge repository contains current and complete information.

Knowledge storage: There is a need to maintain the quality of data within the centralised repository. Thus, to ensure the reliability, quality and trustworthiness of the data within the knowledge repository, future researchers can develop advanced data profiling algorithms. These algorithms should automatically analyse the statistical properties and characteristics of the disaster-related datasets. Future researchers can also research anomaly detection techniques suitable for the centralised repository to identify data quality issues, such as inconsistencies within the repository.

Knowledge processing, analysis and visualisation: Future researchers can research and recommend the most appropriate techniques to automatically extract structured knowledge from unstructured data sources, such as social media posts, emergency reports and news articles using Natural Language Processing (NLP) and information extraction techniques.

Knowledge sharing and dissemination implementation plan: To enhance situational awareness, future researchers can research intelligent knowledge reasoning systems. They can investigate machine learning and deep learning models to automatically learn relationships, patterns and correlations from the data in the knowledge repository. The system should be able to make more accurate recommendations and predictions such as proposing optimal resource allocation and forecasting the impact of an impending disaster.

Based on the identified extraneous variables future researchers can:

- Investigate ways for integrating IK and perspectives into the KM framework to improve its relevance and responsiveness to local needs.
- Examine the influence of existing regulations, policies and legal frameworks\ on the development and implementation of KMS for disaster response.

9.6 Chapter summary

This chapter commenced with a summary of the entire thesis from the first to the last chapter, explaining the focus of each chapter and how it addresses the objectives of the study. This summary was followed by the conclusions drawn from the study for each objective. Subsequently, the contributions of the study were discussed, followed by the limitations of the study. Lastly, the suggested areas of further studies were given.

References

- Abbas, R., Madanian, S., & Parry, D. T. (2016). Disaster e-health and interagency communication in disaster healthcare: A suggested road map. *Proceedings of the Health Informatics New Zealand (HINZ) Annual Conference, Auckland, November.*
- Abbas, R., Norris, A. C., & Parry, D. T. (2018). Pinpointing What Is Wrong With Cross-Agency Collaboration in Disaster Healthcare. *Journal of the International Society for Telemedicine and Ehealth*, 6, 3–4. http://journals.ukzn.ac.za/index.php/JISfTeH/article/view/354
- Abbasi, A. (2014). Link formation pattern during emergency response network dynamics. *Natural Hazards*, *71*(3), 1957–1969. https://doi.org/10.1007/s11069-013-0988-0
- Abbasi, A., & Kapucu, N. (2016). A longitudinal study of evolving networks in response to natural disaster. *Computational and Mathematical Organization Theory*, 22(1), 47–70. https://doi.org/10.1007/s10588-015-9196-7
- Abbasi, A., Sadeghi-Niaraki, A., Jalili, M., & Choi, S.-M. (2018). Enhancing response coordination through the assessment of response network structural dynamics. *Bulletin of the American Astronomical Society*, *13*(2). https://doi.org/10.7910/DVN/JIZOTK.Funding
- Abdeen, F. N., Fernando, T., Kulatunga, U., Hettige, S., & Ranasinghe, K. D. A. (2021).
 Challenges in multi-agency collaboration in disaster management: A Sri Lankan perspective.
 International Journal of Disaster Risk Reduction, 62(February), 102399.
 https://doi.org/10.1016/j.ijdrr.2021.102399
- Adem, S. Al, Childerhouse, P., Egbelakin, T., & Wang, B. (2018). International and local NGO supply chain collaboration: An investigation of the Syrian refugee crises in Jordan. *Journal* of Humanitarian Logistics and Supply Chain Management, 8(3), 295–322. https://doi.org/10.1108/JHLSCM-05-2017-0020
- Ahangama, N., & Prasanna, R. (2017). Knowledge Improvisation during floods. 3rd International Moratuwa Engineering Research Conference, MERCon 2017, 455–460. https://doi.org/10.1109/MERCon.2017.7980527
- Al-Ababneh, M. M. (2020). Linking Ontology, Epistemology and Research Methodology. Science & Philosophy, 8(1), 75–91. https://doi.org/10.23756/sp.v8i1.500
- Aldrich, D. P. (2019). Challenges to Coordination: Understanding Intergovernmental Friction During Disasters. International Journal of Disaster Risk Science, 10(3), 306–316. https://doi.org/10.1007/s13753-019-00225-1
- Ali, Y., Mohammad, A., Ahmad, N., & Hidayati, N. (2015). *Knowledge Sharing Framework for Disaster Management.* 9(February), 50–60.
- Aming'a, N. N. (2015). Knowledge capture and acquisition mechanisms at Kisii University.

Interdisciplinary Journal of Information, Knowledge, and Management, 10, 105–116. https://doi.org/10.28945/2284

- Andrea, B. (2016). *Knowledge of Management Tools and Systems in SMEs. November*, 180–203. https://doi.org/10.4018/978-1-5225-1642-2.ch009
- Andreassen, N., Borch, O. J., & Ikonen, E. (2019). Organizing emergency response in the *European Arctic: A comparative study of Norway, Russia, Iceland and Greenland* (Issue 46).
- Andreassen, N., Borch, O. J., & Sydnes, A. K. (2020a). Information sharing and emergency response coordination. *Safety Science*, *130*(November 2019). https://doi.org/10.1016/j.ssci.2020.104895
- Andreassen, N., Borch, O. J., & Sydnes, A. K. (2020b). Information sharing and emergencyresponsecoordination.SafetyScience,130(February).https://doi.org/10.1016/j.ssci.2020.104895
- Andrews, S., Gibson, H., Domdouzis, K., & Akhgar, B. (2016). Creating corroborated crisis reports from social media data through formal concept analysis. *Journal of Intelligent Information Systems*, 47(2), 287–312. https://doi.org/10.1007/s10844-016-0404-9
- Antunes, H. de J. G., & Pinheiro, P. G. (2020). Linking knowledge management, organizational learning and memory. *Journal of Innovation and Knowledge*, 5(2), 140–149. https://doi.org/10.1016/j.jik.2019.04.002
- Asamoah, C., Akussah, H., & Musah, A. (2018). Recordkeeping and disaster management in public sector institutions in Ghana. *Records Management Journal*, 28(3), 218–233. https://doi.org/10.1108/RMJ-01-2018-0001
- Badarudin, P. H. A. P., Au, T. W., & Phon-Amnuaisuk, S. (2017). A knowledge-based framework for mitigating hydro-meteorological disasters. *Lecture Notes in Computer Science (Including Subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics)*, 10387 *LNCS*, 505–513. https://doi.org/10.1007/978-3-319-61845-6_50
- Banugire, F. R. (2018). the Role of Universities in Sustainable Rural Development: Towards a Knowledge Intermediation Model of University Community Outreach Programs. 4, 18–27. https://doi.org/10.17501/icoss.2017.4103
- Baskerville, R., Baiyere, A., Gregor, S., Hevner, A., & Rossi, M. (2018). Design science research contributions: Finding a balance between artifact and theory. *Journal of the Association for Information Systems*, *19*(5), 358–376. https://doi.org/10.17705/1jais.00495
- Becerra-Fernandez, I., Prietula, M., Madey, G., & Rodriguez, D. (2007). Project ENSAYO: A virtual emergency operations center for disaster management research, training and discovery. Second International Conference on Internet Monitoring and Protection, ICIMP

2007, Icimp, 31. https://doi.org/10.1109/ICIMP.2007.35

- Bencherki, N. (2017). Actor–Network Theory. *The International Encyclopedia of Organizational Communication, January*, 1–13. https://doi.org/10.1002/9781118955567.wbieoc002
- Bigley, G. A., & Roberts, K. H. (2001). The Incident Command System : High-Reliability Organizing for Complex and Volatile Task Environments Author (s): Gregory A. Bigley and Karlene H . Roberts Published by : Academy of Management Stable URL : http://www.jstor.org/stable/3069401 REFERENCES. Academy of Management Journal, 44(6), 1281–1299.
- Bisri, M. B. F., & Beniya, S. (2016). Analyzing the national disaster response framework and interorganizational network of the 2015 Nepal/Gorkha earthquake. *Procedia Engineering*, 159(June), 19–26. https://doi.org/10.1016/j.proeng.2016.08.059
- Bjerge, B., Clark, N., Fisker, P., & Raju, E. (2016). Technology and information sharing in disaster relief. *PLoS ONE*, *11*(9), 1–20. https://doi.org/10.1371/journal.pone.0161783
- Bogna, F., Raineri, A., & Dell, G. (2020). Critical realism and constructivism: merging research paradigms for a deeper qualitative study. *Qualitative Research in Organizations and Management: An International Journal*, *15*(4), 461–484. https://doi.org/10.1108/QROM-06-2019-1778
- Boin, A., & Lagadec, P. (2000). Preparing for the Future: Critical Challenges in Crisis Management. Journal of Contingencies and Crisis Management, 8(4), 185–191. https://doi.org/10.1111/1468-5973.00138
- Bonache, J., & Festing, M. (2020). *Research paradigms in international human resource management : An epistemological systematisation of the field.* https://doi.org/10.1177/2397002220909780
- Branda, N., Toddi, S., Velez, A.-L. K., & Zheng, Y. (2018). The structure of effective governance of Disaster response networks. *American Review of Public Admnistration*, *48*(7), 699–715.
- Briggs, S. M. (2009). Regional interoperability: Making systems connect in complex disasters. *Journal of Trauma - Injury, Infection and Critical Care*, 67(SUPPL. 2), 88–90. https://doi.org/10.1097/TA.0b013e3181adbcc0
- Brugh, W., Sorokin, G., & Bar-Yam, Y. (2015). *Combining Distributed and Centralized Systems in Disaster Response*. 3–25.
- Bunker, D., Levine, L., & Woody, C. (2014). Repertoires of collaboration for common operating pictures of disasters and extreme events. *Information Systems Frontiers*, *17*(1), 51–65. https://doi.org/10.1007/s10796-014-9515-4

Carby, B. E. (2019). A Knowledge Management Initiative in Support of the Caribbean

Comprehensive Disaster Management Framework and DRM Capacity Building. *Strengthening Disaster Resilience in Small States*, *Unisdr* 2015, 125–142. https://doi.org/10.14217/68d69843-en

- Carroll, M. S., Cohn, P. J., Seesholtz, D. N., & Higgins, L. L. (2005). Fire as a galvanizing and fragmenting influence on communities: The case of the Rodeo-Chediski fire. *Society and Natural Resources*, *18*(4), 301–320. https://doi.org/10.1080/08941920590915224
- Carroll, M. S., Higgins, L. L., Cohn, P. J., & Burchfield, J. (2006). Community wildfire events as a source of social conflict. *Rural Sociology*, 71(2), 261–280. https://doi.org/10.1526/003601106777789701
- Celik, S., & Corbacioglu, S. (2018). Organizational Learning In Adapting To Dynamic Disaster Environments In Southern Turkey. *Journal of Asian and African Studies*, *53*(2), 217–232. https://doi.org/10.1177/0021909616677368
- Chaturvedi, S., & Singh, T. (2021). Knowledge Management Initiatives for Tackling the COVID-19 Pandemic in India. *Metamorphosis: A Journal of Management Research*, *20*(1), 25–34. https://doi.org/10.1177/09726225211023677
- Chaves Gattaz, C., Cruvinel, P. E., & Bernardes, R. C. (2016). Leveraging Digital Knowledge Ecosystem Framework Implementation Case Study: Aligning Knowledge Management and Innovation Goals for Agricultural Aerial Pest Control. *Proceedings - 2016 IEEE 10th International Conference on Semantic Computing, ICSC 2016*, 417–424. https://doi.org/10.1109/ICSC.2016.81
- Chevalier, J. M., & Buckles, D. J. (2013). Handbook for Participatory Action Research, Planning and Evaluation. March, 175–186. https://doi.org/10.1145/2642937.2642998
- Chipman, R., & Wuerfel, R. (2008). Network based information sharing between emergency operations center. 2008 IEEE International Conference on Technologies for Homeland Security, HST'08, 155–160. https://doi.org/10.1109/THS.2008.4534441
- Chiponde, D. B., Gledson, B., & Greenwood, D. (2022). Organisational learning from failure and the needs-based hierarchy of project-based organisations. *Frontiers in Engineering and Built Environment*, 2(2), 121–132. https://doi.org/10.1108/febe-10-2021-0051
- Chisita, C. T., & Fombad, M. C. (2020). Knowledge sharing to support climate change adaptation in Zimbabwe: Views from selected climate action organisations. VINE Journal of Information and Knowledge Management Systems, 51(2), 333–350. https://doi.org/10.1108/VJIKMS-10-2019-0161
- Choo, C. W., Furness, C., Paquette, S., Van Den Berg, H., Detlor, B., Bergeron, P., & Heaton, L. (2006). Working with information: Information management and culture in a professional

services organization. *Journal of Information Science*, *32*(6), 491–510. https://doi.org/10.1177/0165551506068159

- Christian Blind Mission. (2019). CBM Christian Blind Mission. https://www.cbm.org/news/blog/blogs/blogs-2019/cbm-zimbabwe-country-directordiscusses-the-response-to-cyclone-idai/
- Chua, A. Y. K. (2009). The dark side of successful knowledge management initiatives. *Journal of Knowledge Management*, *13*(4), 32–40. https://doi.org/10.1108/13673270910971806
- Comfort, L. K., & Kapucu, Æ. N. (2006). Inter-organizational coordination in extreme events : The World Trade Center attacks , September 11 , 2001. 309–327. https://doi.org/10.1007/s11069-006-0030-x
- Comfort, L. K., Waugh, W. L., & Cigler, B. A. (2012). Emergency Management Research and Practice in Public Administration: Emergence, Evolution, Expansion, and Future Directions. *Public Administration Review*, 72(4), 539–547. https://doi.org/10.1111/j.1540-6210.2012.02549.x
- Commonwealth of Australia. (2018). Decision making during a crisis: a practical guide. 1–20.
- Corley, K. G., & Gioiia, D. A. (2011). Sahiwal. Academy of Manaagement Review, 36(1), 12–32.
- Cruz, M. A., Hawk, N. M., Poulet, C., Rovira, J., & Rouse, E. N. (2015). Public health incident management: Logistical and operational aspects of the 2009 initial outbreak of H1N1 influenza in Mexico. *Journal of Emergency Management*, *13*(1), 71–77. https://doi.org/10.5055/jem.2015.0219
- Cummings, J. N., & Cross, R. (2003). Structural properties of work groups and their consequences for performance. *Social Networks*, 25(3), 197–210. https://doi.org/10.1016/S0378-8733(02)00049-7
- Curado, C., & Bontis, N. (2006). The knowledge-based view of the firm and its theoretical precursor. *International Journal of Learning and Intellectual Capital*, *3*(4), 367–381. https://doi.org/10.1504/IJLIC.2006.011747
- Curnin, S. (2015). Spanning boundaries to support effective multi-agency coordination in emergency management. February.
- Dalkir, K. (2013). Knowledge Management in Theory and Practice. In *Knowledge Management in Theory and Practice*. https://doi.org/10.4324/9780080547367
- Der Heide, E. A., Lafond, R., Eyre, A., Fertel, N., Fisher, J. M., Gunn, S., Hampton, D., Lederman, B., Posner, Z., Preobrajensky, V. N., Rebonato, M., Riboni, V., Rodriguez, D., Shih, C. L., & Yamamoto, Y. (2001). Theme 1. disaster coordination and management: Summary and action plans. *Prehospital and Disaster Medicine*, 16(1), 22–25.

https://doi.org/10.1017/S1049023X00025504

- Djalante, R., Holley, C., Thomalla, F., & Carnegie, M. (2013). Pathways for adaptive and integrated disaster resilience. *Natural Hazards*, 69(3), 2105–2135. https://doi.org/10.1007/s11069-013-0797-5
- Dorasamy, M., & Raman, M. (2011). *Knowledge Management Systems for Emergency Managers : Malaysian Perspective. June*, 289–296.
- Dorasamy, M., Raman, M., & Kaliannan, M. (2017). Integrated community emergency management and awareness system: A knowledge management system for disaster support. *Technological Forecasting and Social Change*, 121, 139–167. https://doi.org/10.1016/j.techfore.2017.03.017
- Dubey, R., Gunasekaran, A., Childe, S. J., Roubaud, D., Fosso Wamba, S., Giannakis, M., & Foropon, C. (2019). Big data analytics and organizational culture as complements to swift trust and collaborative performance in the humanitarian supply chain. *International Journal of Production Economics*, *210*, 120–136. https://doi.org/10.1016/j.ijpe.2019.01.023
- Duong, L. N. K., & Chong, J. (2020). Supply chain collaboration in the presence of disruptions: a literature review. *International Journal of Production Research*, *58*(11), 3488–3507. https://doi.org/10.1080/00207543.2020.1712491
- Dyer, J. H., & Chu, W. (2003). The role of trustworthiness in reducing transaction costs and improving performance: Empirical evidence from the United States, Japan, and Korea. *Organization Science*, *14*(1), 57–68. https://doi.org/10.1287/orsc.14.1.57.12806

Edgington, D. W. (2010). Reconstructing Kobe : the geography of crisis and opportunity. 301.

- Edmonstone, J. D. (2018). Organisational learning. *Leadership in Health Services*, *31*(4), 434–440. https://doi.org/10.1108/LHS-08-2017-0050
- Edwards, J. (2011). A Process View of Knowledge Management : It Ain 't What you do , it 's the way That you do it. *Electronic Journal of Knowledge Management*, 9(4), 297–306.
- Elhendawi, A. S. (2020). The Effect Of Knowledge Management On Crisis Management In Higher Institute Of Engineering Professions In Al-Qubba City East Of Libya. 9(06).
- Endsley, M. R. (1988). Design and Evaluation for Situation Awareness Enhancement. Proceedings of the Human Factors Society Annual Meeting. 97–101. https://doi.org/10.1177/154193128803200221
- Esser, D. E., & Janus, H. (2023). How are accountability and organisational learning related? A study of German bilateral development cooperation. *Evaluation*, 29(4), 468–488. https://doi.org/10.1177/13563890231204661
- Evans, M., Dalkir, K., & Bidian, C. (2014). A Holistic View of the Knowledge Life Cycle: The

Knowledge Management Cycle (KMC) Model. *Electronic Journal of Knowledge Management*, *12*(2), 85–97.

- Fang, S. C., Yang, C. W., & Hsu, W. Y. (2013). Inter-organizational knowledge transfer: The perspective of knowledge governance. *Journal of Knowledge Management*, 17(6), 943–957. https://doi.org/10.1108/JKM-04-2013-0138
- Farcas, A., Ko, J., Chan, J., Malik, S., Nono, L., & Chiampas, G. (2021). Use of Incident Command System for Disaster Preparedness: A Model for an Emergency Department COVID-19 Response. *Disaster Medicine and Public Health Preparedness*, *15*(3), e31–e36. https://doi.org/10.1017/dmp.2020.210
- Fareedi, A. A., & Ghazawneh, A. (2018). An ontology approach for knowledge acquisition and development of Health Information System (HIS). *Proceedings of the 27th International Conference on Information Systems Development: Designing Digitalization, ISD 2018.*
- FEMA. (2004). *NIMS Components Guidance and Tools* | *FEMA.gov*. https://www.fema.gov/emergency-managers/nims/components
- FEMA. (2017). National Incident Management System (NIMS). Foundations of Homeland Security: Law and Policy, 3rd editio(October), 279–281. https://doi.org/10.1002/9780470925805.ch20
- Fischer-Preßler, D. (2021). Towards Effective Use of Technology-Enabled Systems in Emergency Management and Crisis Situations. https://doi.org/10.20378/IRB-52620
- Fombad, M., & Fombad, M. (2018). *Knowledge management for poverty eradication: a South African perspective*. https://doi.org/10.1108/JICES-04-2017-0022
- Ganapathy, S., Mansor, Z., & Ahmad, K. (2019). Investigating factors affecting knowledge management practices in public sectors. *International Journal of Advanced Computer Science and Applications*, 10(11), 205–212. https://doi.org/10.14569/IJACSA.2019.0101128
- Gardner, R. O. (2013). The emergent organization: Improvisation and order in gulf coast disaster relief. *Symbolic Interaction*, *36*(3), 237–260. https://doi.org/10.1002/symb.70
- Geister, R., Schwoch, G., & Lieb, J. (2021). *electronic library Real Time Drone Video to Support First Responders*. https://elib.dlr.de/144120/
- Gengler, C. E., Rossi, M., Hui, W., & Bragge, J. (2006). the Design Science Research Process : a Model for Producing and Presenting Information System Research. *In Proceedings of the First International Conference on Design Science Research in Information Systems and Technology, January*, 83–106.
- Gerritsen, A. L., Stuiver, M., & Termeer, C. J. A. M. (2013). Knowledge governance: An exploration of principles, impact, and barriers. *Science and Public Policy*, *40*(5), 604–615.

https://doi.org/10.1093/scipol/sct012

- Ghulam, W. A., Ali, S., & Ali, W. (2023). Risk Management Nexus by Pakistan and China to Combat Novel Corona Virus in the Light of Actor-Network Theory. *Logistic and Operation Management Research (LOMR)*, 2(1), 25–62. https://doi.org/10.31098/lomr.v2i1.1311
- Giddens, A. (1984). Central problems in social theory : action, structure, and contradiction in social analysis. https://books.google.com/books/about/Central_Problems_in_Social_Theory.html?id=jpxkQ -1elyAC
- Girard, J. P. (2005). The Inukshuk: a Canadian model of knowledge management. *Journal of Knowledge Management Professionals Society*, *2*(1), 9–16.

Civil Protection Act, 2001 Zimbabwe (2001).

- Gregor, S. (2006). The Nature of Theory in Information Systems 1. *MIS Quarterly*, 30(3), 611–642.
- Grolinger, K., Capretz, M. A. M., Mezghani, E., & Exposito, E. (2013). Knowledge as a service framework for disaster data management. *Proceedings of the Workshop on Enabling Technologies: Infrastructure for Collaborative Enterprises, WETICE*, 313–318. https://doi.org/10.1109/WETICE.2013.48
- Hage, J., Aiken, M., & Marrett, C. B. (1971). Organization Structure and Communications. *American Sociological Review*, *36*(5), 860. https://doi.org/10.2307/2093672
- Haikerwal, M. (2011). *E* health and natural disasters: planning, communications, mitigation and recovery. 1–4.
- Hallegatte, S., Vogt-Schilb, A., Bangalore, M., & Rozenberg, J. (2017). *Climate Change and Development Series*.
- Hameed, M., Naja, M., Cheeti, S., Sheokand, A., Mago, A., & Desai, S. (2020). Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID- 19. The COVID-19 resource centre is hosted on Elsevier Connect, the company 's public news and information. January.
- Hanlin, E. R., & Schulz, K. (2021). Extraordinary circumstances. 1(295), 418. http://digilib.umpalopo.ac.id:8080/jspui/bitstream/123456789/407/1/0470124296_Extraordi nary Circumstances The Journey of a Corporate Whistleblower.pdf
- Haque, M. (2018). Indigenous knowledge and practices in disaster management: Experiences of the coastal people of Bangladesh. *Disaster Risk Reduction: Community Resilience and Responses*, 59–72. https://doi.org/10.1007/978-981-10-8845-2_4
- Hardy, K., & Comfort, L. K. (2015). Dynamic decision processes in complex, high-risk operations: The Yarnell Hill Fire, June 30, 2013. *Safety Science*, 71(Part A), 39–47.

https://doi.org/10.1016/j.ssci.2014.04.019

- Harrinson, E. (2021). Knowledge Management Based on Information Technology in Response to COVID-19 Crisis | KMInstitute. https://www.kminstitute.org/blog/knowledge-managementbased-information-technology-response-covid-19-crisis
- Harrison, H., Birks, M., Franklin, R., & Mills, J. (2017). Case study research: Foundations and methodological orientations. *Forum Qualitative Sozialforschung*, *18*(1).
- Hawkins, D. (2007). Communications in the Incident Command System. COPS Interoperable Communications Technology Program, 5(2), 1–12. https://www.cdc.gov/niosh/erhms/pdf/cops-interoperable-communications-technologyprogram.pdf
- Hernandez-escobedo, G. (2015). Information Sharing in Major Events.
- Hevner, A., & Chatterje, S. (2004). Design Science Research in Information Systems Overview of Design Science Research. *Ais*, 45.
- Hollenbeck, J. R., Ellis, A. P. J., Humphrey, S. E., Garza, A. S., & Ilgen, D. R. (2011). Asymmetry in structural adaptation: The differential impact of centralizing versus decentralizing team decision-making structures. *Organizational Behavior and Human Decision Processes*, *114*(1), 64–74. https://doi.org/10.1016/j.obhdp.2010.08.003
- Hollweck, T. (2016). Robert K. Yin. (2014). Case Study Research Design and Methods (5th ed.).
 Thousand Oaks, CA: Sage. 282 pages. In *The Canadian Journal of Program Evaluation* (Vol. 1, Issue 2014). https://doi.org/10.3138/cjpe.30.1.108
- Holsapple, C. W., & Joshi, K. D. (1999). Description and analysis of existing knowledge management frameworks. *Proceedings of the Hawaii International Conference on System Sciences, February 1999*, 45. https://doi.org/10.1109/hicss.1999.772796
- Horrigan, P. T. (2024). Strategies for Supporting Blockchain Technologies to Enable Walden University.
- Hunt, S., Smith, K., Hamerton, H., & Sargisson, R. J. (2014). An incident control centre in action: Response to the rena oil spill in New Zealand. *Journal of Contingencies and Crisis Management*, 22(1), 63–66. https://doi.org/10.1111/1468-5973.12036
- Inan, D. I., & Opper, S. (2015). Towards knowledge sharing in disaster management: An agent oriented knowledge analysis framework. 1–13.
- Ishiwatari, M. (2021). Institutional Coordination of Disaster Management: Engaging National and Local Governments in Japan. *Natural Hazards Review*, 22(1), 1–6. https://doi.org/10.1061/(asce)nh.1527-6996.0000423

Iskandar, K., Jambak, M. I., Kosala, R., & Prabowo, H. (2017). Current Issue on Knowledge

Management System for future research: A Systematic Literature Review. *Procedia Computer Science*, *116*(Iccsci), 68–80. https://doi.org/10.1016/j.procs.2017.10.011

- Jennex, M. E. (2012). Identifying the components of a knowledge management strategy. *18th Americas Conference on Information Systems 2012, AMCIS 2012, 4*, 2602–2610.
- Jennex, M. E., & Raman, M. (2009). *Knowledge Management in Support of Crisis Response*. *July*. https://doi.org/10.4018/jiscrm.2009070104
- Jha, A., Lin, L., Short, S. M., Argentini, G., Gamhewage, G., & Savoia, E. (2018). Integrating emergency risk communication (ERC) into the public health system response: Systematic review of literature to aid formulation of the 2017 WHO Guideline for ERC policy and practice. *PLoS ONE*, *13*(10), 1–23. https://doi.org/10.1371/journal.pone.0205555
- Jones, M. R., & Karsten, H. (2008a). Giddens's Structuration Theory and Information Systems Research Qjfteriy Giddens's Structuration Theory and Information Systems Research1. In *Source: MIS Quarterly* (Vol. 32, Issue 1).
- Jones, M. R., & Karsten, H. (2008b). Giddens 'S S Tructuration T Heory and. *MIS Quarterly*, 32(1), 127–157.
- Josè Moisès, D., Kgabi, N., & Kunguma, O. (2023). Integrating "Top-Down" and "Community-Centric" Approaches for Community-Based Flood Early Warning Systems in Namibia. *Challenges*, *14*(4), 44. https://doi.org/10.3390/challe14040044
- Kapucu, N., Arslan, T., & Collins, M. L. (2010). Examining intergovernmental and interorganizational response to catastrophic disasters: Toward a network-centered approach. *Administration and Society*, 42(2), 222–247. https://doi.org/10.1177/0095399710362517
- Katanha, A., & Simatele, D. (2019). Natural hazard mitigation strategies review: Actor–network theory and the eco-based approach understanding in Zimbabwe. *Jamba: Journal of Disaster Risk Studies*, *11*(1), 1–9. https://doi.org/10.4102/JAMBA.V11I1.629
- Khatoon, S., Asif, A., Hasan, M. M., & Alshamari, M. (2022). Social Media-Based Intelligence for Disaster Response and Management in Smart Cities. *Springer Optimization and Its Applications*, 186, 211–235. https://doi.org/10.1007/978-3-030-84459-2_11
- Kivunja, C., & Kuyini, A. B. (2017). Understanding and Applying Research Paradigms in Educational Contexts. *International Journal of Higher Education*, 6(5), 26. https://doi.org/10.5430/ijhe.v6n5p26
- Latour, B. (2005). Reassembling the Social. An Introduction to Actor-Network-Theory (translated by Irina Polonskaya). In *Journal of Economic Sociology* (Vol. 14, Issue 2). https://doi.org/10.17323/1726-3247-2013-2-73-87

- Lee, G. H., Bae, J. W., Oh, N., Hong, J. H., & Moon, I. C. (2015). Simulation Experiment of Disaster Response Organizational Structures With Alternative Optimization Techniques. Social Science Computer Review, 33(3), 343–371. https://doi.org/10.1177/0894439314544628
- Ley, B., Ludwig, T., Pipek, V., Randall, D., Reuter, C., & Wiedenhoefer, T. (2014). Information and Expertise Sharing in Inter-Organizational Crisis Management. *Computer Supported Cooperative Work: CSCW: An International Journal*, 23(4–6), 347–387. https://doi.org/10.1007/s10606-014-9205-2
- Li, C., Zhang, F., Cao, C., Liu, Y., & Qu, T. (2019). Organizational coordination in sustainable humanitarian supply chain: An evolutionary game approach. *Journal of Cleaner Production*, 219, 291–303. https://doi.org/10.1016/j.jclepro.2019.01.233
- Lin, Z., Zhao, X., Ismail, K. M., & Carley, K. M. (2006). Organizational design and restructuring in response to crises: Lessons from computational modeling and real-world cases. *Organization Science*, *17*(5), 598–618. https://doi.org/10.1287/orsc.1060.0210
- Loop, O., Lubitz, D. K. J. E. Von, Beakley, J. E., & Patricelli, F. (2008). 'All hazards approach 'to disaster management : the role of information and knowledge management , Boyd 's. 32(4), 561–585.
- Luff, P., Heath, C., Patel, M., Vom Lehn, D., & Highfield, A. (2018). Creating Interdependencies: Managing Incidents in Large Organizational Environments. *Human-Computer Interaction*, 33(5–6), 544–584. https://doi.org/10.1080/07370024.2017.1412830
- Malalgoda, C., Amaratunga, D., & Haigh, R. (2015). University of Huddersfield Repository Integrating universities with the built environment practice and the communities in disaster Original Citation management education . In: Proceedings of the 8th International Conference of Faculty of The University R.
- Malone, T. W., & Crowston, K. (1990). What is coordination theory and how can it help design cooperative work systems? *Proceedings of the 1990 ACM Conference on Computer-Supported Cooperative Work, CSCW 1990, May,* 357–370. https://doi.org/10.1145/99332.99367
- Manandhar, R., & McEntire, D. A. (2014). Disasters, Development, and Resilience: Exploring the Need for Comprehensive Vulnerability Management. *Disaster and Development*, 19–37. https://doi.org/10.1007/978-3-319-04468-2 2
- Manyoma, Y. A. C., Reyes, N. D. G., & Bohorquez, L. E. (2019). Organizational Features in Disaster Risk Management Systems. *IFIP Advances in Information and Communication Technology*, 550(2012), 155–174. https://doi.org/10.1007/978-3-030-32169-7_12

- Marcum, C. S., Bevc, C. A., & Butts, C. T. (2012). Mechanisms of Control in Emergent Interorganizational Networks. *Policy Studies Journal*, *40*(3), 516–546. https://doi.org/10.1111/j.1541-0072.2012.00463.x
- McKinsey and Company. (n.d.). *Enduring Ideas: The 7-S Framework* | *McKinsey*. Retrieved August 1, 2024, from https://www.mckinsey.com/capabilities/strategy-and-corporatefinance/our-insights/enduring-ideas-the-7-s-framework
- Mitiku, T., & Hailu, W. (2017). The role of Oromo indigenous knowledge in disaster Management and Protection: the case of Kuttaayee Oromo in Ambo district. *International Journal of Multicultural and Multireligious Understanding*, 4(5), 16. https://doi.org/10.18415/ijmmu.v4i5.89
- Modh, S. (2010). Introduction To Disaster Management Secretariat. January, 1–196. https://www.researchgate.net/publication/277327554_Introduction_to_Disaster_Manageme nt
- Mohan, P., & Mittal, H. (2020). Review of ICT usage in disaster management. International Journal of Information Technology (Singapore), 12(3), 955–962. https://doi.org/10.1007/s41870-020-00468-y
- Mouritsen, J. a N. (1999). and K Nowledge M Anagement : *Australian Accounting Review*, *9*(3), 15–26.
- Moynihan, D. P. (2008). Combining structural forms in the search for policy tools: Incident command systems in U.S. crisis management. *Governance*, *21*(2), 205–229. https://doi.org/10.1111/j.1468-0491.2008.00395.x
- Mustapha, S. M. F. D. S. (2024). Towards building general framework for designing knowledge sharing tool based on actor network theory. VINE Journal of Information and Knowledge Management Systems, 54(5), 949–972. https://doi.org/10.1108/VJIKMS-01-2022-0010
- Nadizadeh, A., Sabzevari Zadeh, A., & Sahraeian, R. (2011). Determination of the Knowledge Management Strategy (A Case: Iran Alloy Steel Company). *International Journal of Engineering and Technology*, 3(6), 689–695. https://doi.org/10.7763/ijet.2011.v3.306
- Nazim, M., & Mukherjee, B. (2016). Knowledge Management Strategy. *Knowledge Management in Libraries*, 89–113. https://doi.org/10.1016/b978-0-08-100564-4.00005-3
- Neville, K., Riordan, S. O., Pope, A., Rauner, M., Madden, M., Sweeney, J., Nussbaumer, A., Brien, C. O., Neville, K., Riordan, S. O., Pope, A., Rauner, M., Madden, M., Sweeney, J., Nussbaumer, A., & Mccarthy, N. (2016). *Towards the development of a decision support system for multi-agency decision-making during cross-border emergencies*. 0125(June). https://doi.org/10.1080/12460125.2016.1187393

Nonaka. (1997). Nonaka's Four Modes of Knowledge Conversion. Organization, 5, 14–37.

- Nowell, B., Bodkin, C. P., & Bayoumi, D. (2017). Redundancy as a strategy in disaster response systems: A pathway to resilience or a recipe for disaster? *Journal of Contingencies and Crisis Management*, 25(3), 123–135. https://doi.org/10.1111/1468-5973.12178
- Nowell, B., & Steelman, T. (2015). Communication under Fire: The Role of Embeddedness in the Emergence and Efficacy of Disaster Response Communication Networks. *Journal of Public Administration Research and Theory*, *25*(3), 929–952. https://doi.org/10.1093/jopart/muu021
- O'Brien, A., Read, G. J. M., & Salmon, P. M. (2020). Situation Awareness in multi-agency emergency response: Models, methods and applications. *International Journal of Disaster Risk Reduction*, *48*, 101634. https://doi.org/10.1016/j.ijdrr.2020.101634
- Oh, S. young, & Han, H. seok. (2020). Facilitating organisational learning activities: Types of organisational culture and their influence on organisational learning and performance. *Knowledge Management Research and Practice*, *18*(1), 1–15. https://doi.org/10.1080/14778238.2018.1538668
- Oktari, R. S., Munadi, K., Idroes, R., & Sofyan, H. (2020). Knowledge management practices in disaster management: Systematic review. *International Journal of Disaster Risk Reduction*, 51(January), 101881. https://doi.org/10.1016/j.ijdrr.2020.101881
- Owen, C., Bearman, C., Brooks, B., Chapman, J., Paton, D., & Hossain, L. (2013). Developing a research framework for complex multi-team coordination in emergency management. *International Journal of Emergency Management*, 9(1), 1–17. https://doi.org/10.1504/IJEM.2013.054098
- Panayiotis, S., Aliki, P. C.-, Maria, G., & Henk, J. S. (2017). A Common Operational Picture in Support of Situational Awareness for Efficient Emergency Response Operations. *Journal of Future Internet*, 2(1), 10–35. https://doi.org/10.18488/journal.102.2017.21.10.35
- Parker, G. W. (2020). Best practices for after-action review: turning lessons observed into lessons learned for preparedness policy. *Revue Scientifique et Technique (International Office of Epizootics)*, 39(2), 579–590. https://doi.org/10.20506/rst.39.2.3108
- Paveglio, T. B., Carroll, M. S., Hall, T. E., & Brenkert-Smith, H. (2015). "Put the wet stuff on the hot stuff": The legacy and drivers of conflict surrounding wildfire suppression. *Journal of Rural Studies*, *41*(August), 72–81. https://doi.org/10.1016/j.jrurstud.2015.07.006
- Peffers, K., Tuunanen, T., Rothenberger, M. A., & Chatterjee, S. (2007). A design science research methodology for information systems research. *Journal of Management Information Systems*, 24(3), 45–77. https://doi.org/10.2753/MIS0742-1222240302

Peker, I., Ar, I. M., Erol, I., & Searcy, C. (2023). Leveraging blockchain in response to a pandemic

through disaster risk management: an IF-MCDM framework. *Operations Management Research*, *16*(2), 642–667. https://doi.org/10.1007/s12063-022-00340-1

- Pereira, V., & Bamel, U. (2021). Extending the resource and knowledge based view: A critical analysis into its theoretical evolution and future research directions. *Journal of Business Research*, *132*(April), 557–570. https://doi.org/10.1016/j.jbusres.2021.04.021
- Pour, F. S. A. (2021). Application of a Blockchain Enabled Model in Disaster Aids Supply Network Resilience. https://doi.org/10.25777/fkr7-a212
- Prasanna, S. R., & Haavisto, I. (2018). Collaboration in humanitarian supply chains: an organisational culture framework. *International Journal of Production Research*, 56(17), 5611–5625. https://doi.org/10.1080/00207543.2018.1475762
- Presbitero, A., Roxas, B., & Chadee, D. (2017). Effects of intra-and inter-team dynamics on organisational learning: role of knowledge-sharing capability. *Knowledge Management Research and Practice*, 15(1), 146–154. https://doi.org/10.1057/KMRP.2015.15
- Provan, K. G., Fish, A., & Sydow, J. (2007). Interorganizational networks at the network nevel: A review of the empirical literature on whole networks. *Journal of Management*, 33(3), 479– 516. https://doi.org/10.1177/0149206307302554
- Provan, K. G., & Lemaire, R. H. (2012). Core Concepts and Key Ideas for Understanding Public Sector Organizational Networks: Using Research to Inform Scholarship and Practice. *Public Administration Review*, 72(5), 638–648. https://doi.org/10.1111/j.1540-6210.2012.02595.x
- Qadir, J., Ali, A., ur Rasool, R., Zwitter, A., Sathiaseelan, A., & Crowcroft, J. (2016). Crisis analytics: big data-driven crisis response. *Journal of International Humanitarian Action*, 1(1), 1–21. https://doi.org/10.1186/S41018-016-0013-9/TABLES/1
- Qi, M., Li, X., & Wang, W. (2022). Innovation in Boundary-Spanning Technology M&A: A Fuzzy-Set Analysis of Diversity Dynamics. *Frontiers in Psychology*, *13*(July). https://doi.org/10.3389/fpsyg.2022.766166
- Rådberg, K. K., & Löfsten, H. (2023). Developing a knowledge ecosystem for large-scale research infrastructure. *Journal of Technology Transfer*, 48(1), 441–467. https://doi.org/10.1007/s10961-022-09945-x
- Rasool, S. F., Samma, M., Wang, M., Zhao, Y., & Zhang, Y. (2019). How human resource management practices translate into sustainable organizational performance: the mediating role of product, process and knowledge innovation. *Psychology Research and Behavior Management*, *12*, 1009–1025. https://doi.org/10.2147/PRBM.S204662
- Rimstad, R., Njå, O., Rake, E. L., & Braut, G. S. (2014). Incident command and information flows in a large-scale emergency operation. *Journal of Contingencies and Crisis Management*,

22(1), 29-38. https://doi.org/10.1111/1468-5973.12033

- Ritala, P., De Kort, C., & Gailly, B. (2023). Orchestrating Knowledge Networks: Alter-Oriented Brokering. *Journal of Management*, *49*(3), 1140–1178. https://doi.org/10.1177/01492063221086247
- Rohajawati, S., & Akbar, H. (2021). Assessing readiness for knowledge management implementation in mental hospitals, Indonesia. *International Journal of Engineering & Technology*, *10*(2), 134. https://doi.org/10.14419/ijet.v10i2.31198
- Rosida, R. F., Amaliah, L. N., Mahardika, I. K., & Suratno, S. (2023). The process of forming knowledge: In the study of ontology, epistemology, and axiology. *International Journal for Educational and Vocational Studies*, 5(1), 13. https://doi.org/10.29103/ijevs.v5i1.12980
- Rouhi, N., Gorji, H., & Maleki, M. (2019). *Nongovernmental organisations coordination models in natural hazards: A systematic review. January*, 1–6. https://doi.org/10.4103/jehp.jehp
- Salem, F., & Jarrar, Y. (2009). Cross-Agency Collaboration in the UAE Government: The Role of Trust and Impact of Technology. May.
- Sanford, S., Schwartz, B., & Khan, Y. (2020). The role of tacit knowledge in communication and decision-making during emerging public health incidents. *International Journal of Disaster Risk Reduction*, 50, 101681. https://doi.org/10.1016/j.ijdrr.2020.101681
- Santoro, G., Vrontis, D., Thrassou, A., & Dezi, L. (2018). The Internet of Things: Building a knowledge management system for open innovation and knowledge management capacity. *Technological Forecasting and Social Change*, 136, 347–354. https://doi.org/10.1016/j.techfore.2017.02.034
- Saunders, M, Lewis, P., & Thornhill, A. (2012). Research Methods for Business Research Methods for Business. In H. Pearson Education Ltd. (Ed.), *Research methods for business* (Issue 1, pp. 106–135). Scientific Research Publishing. https://www.scirp.org/(S(i43dyn45teexjx455qlt3d2q))/reference/ReferencesPapers.aspx?R eferenceID=1353990
- Saunders, Mark, Lewis, P., & Thornhill, A. (2009). Research Methods for Business Students Fifth Editon. *Pearson, Fifth Edit*(1), 649. https://eclass.teicrete.gr/modules/document/file.php/DLH105/Research Methods for Business Students%2C 5th Edition.pdf
- Schakel, J. K., & Wolbers, J. (2021). To the edge and beyond: How fast-response organizations adapt in rapidly changing crisis situations. *Human Relations*, 74(3), 405–436. https://doi.org/10.1177/0018726719893450
- Scotland, J. (2012). Exploring the Philosophical Underpinnings of Research : Relating Ontology

and Epistemology to the Methodology and Methods of the Scientific , Interpretive , and Critical Research Paradigms. 5(9), 9–16. https://doi.org/10.5539/elt.v5n9p9

- Sederholm, T., Ekman, S., Paakkonen, H., & Huhtinen, A. M. (2021). Inter-organisational communication and situational awareness in an emergency operation centre during major incidents. *International Journal of Emergency Management*, *17*(1), 47–64. https://doi.org/10.1504/IJEM.2021.118771
- Seifi, B., Seyedin, H., & Ghanizadeh, G. (2019). The Role of Academic Partnership in Disaster Risk Management: A Systematic Review. *Disaster Medicine and Public Health Preparedness*, *13*(5–6), 1047–1058. https://doi.org/10.1017/dmp.2018.164
- Shahparvari, S., & Bodaghi, B. (2018). Risk reduction for distribution of the perishable rescue items; A possibilistic programming approach. *International Journal of Disaster Risk Reduction*, 31, 886–901. https://doi.org/10.1016/j.ijdrr.2018.07.018
- Shannak;, R. O. R. M. M. M. A. A. (2012). Knowledge Management Strategy Building : *European Scientific Journa*, *8*(15), 143–168.
- Shaw, M. S. · R. (2021). *Emerging Technologies for Disaster Resilience*. https://doi.org/10.1007/978-981-16-0360-0_2
- Shi, X., Zhang, Q., & Zheng, Z. (2019). The double-edged sword of external search in collaboration networks: embeddedness in knowledge networks as moderators. *Journal of Knowledge Management*, 23(10), 2135–2160. https://doi.org/10.1108/JKM-04-2018-0226
- Shokr, I., Jolai, F., & Bozorgi-Amiri, A. (2022). A collaborative humanitarian relief chain design for disaster response. *Computers and Industrial Engineering*, 172(PA), 108643. https://doi.org/10.1016/j.cie.2022.108643
- Shujahat, M., Sousa, M. J., Hussain, S., Nawaz, F., Wang, M., & Umer, M. (2019). Translating the impact of knowledge management processes into knowledge-based innovation: The neglected and mediating role of knowledge-worker productivity. *Journal of Business Research*, 94(November), 442–450. https://doi.org/10.1016/j.jbusres.2017.11.001
- Siddique, C. M. (2012). Knowledge management initiatives in the United Arab Emirates: A baseline study. *Journal of Knowledge Management*, 16(5), 702–723. https://doi.org/10.1108/13673271211262763
- Siembieda, W. J. (2012). Transactions and Friction as Concepts to Guide Disaster Recovery Policy. *Int. J. Disaster Risk Sci*, *13753*(1), 38–44. https://doi.org/10.1007/s13753-012-0005-3
- Simpson, N. C. (2012). On Disaster Response and Emergent Systems: A New Taxonomy for
OperationsManagement.SSRNElectronicJournal,1–39.

https://doi.org/10.2139/ssrn.2039466

- Skar, M., Sydnes, M., & Sydnes, A. K. (2016). Integrating unorganized volunteers in emergency response management: A case study. *International Journal of Emergency Services*, 5(1), 52–65. https://doi.org/10.1108/IJES-04-2015-0017
- Soini, J., Linna, P., Leppäniemi, J., & Jaakkola, H. (2009). Toward collaborative situational awareness in a time-critical operational environment. *PICMET: Portland International Center* for Management of Engineering and Technology, Proceedings, 266–270. https://doi.org/10.1109/PICMET.2009.5262236
- Srivastava, B. (2022). The Knowledge Based View of the Firm: An Assessment. *Journal of Organizational Psychology*, 22(3), 74–84. https://doi.org/10.33423/jop.v22i3.5648
- Stankosky, M. (2005). Creating the discipline of knowledge management: the latest in university research. 242.
- Stanton, N. A., Salmon, P. M., Walker, G. H., Salas, E., & Hancock, P. A. (2017). State-of-science: situation awareness in individuals, teams and systems. *Ergonomics*, 60(4), 449–466. https://doi.org/10.1080/00140139.2017.1278796
- Steelman, T. A., & Nowell, B. (2013). The Role of Responder Networks in Promoting Community Resilience: Toward a Measurement Framework of Network Capacity. *Disaster Resiliency*, 254–279. https://doi.org/10.4324/9780203102459-23
- Steelman, T. A., Nowell, B., Bayoumi, D., & McCaffrey, S. (2014). Understanding Information Exchange During Disaster Response: Methodological Insights From Infocentric Analysis. In Administration and Society (Vol. 46, Issue 6). https://doi.org/10.1177/0095399712469198
- Stumpenhorst, M., & Stumpenhorst, R. (2011). The UN OCHA cluster approach : gaps between theory and practice The UN OCHA cluster approach : gaps between theory and practice. May 2016, 586–592. https://doi.org/10.1007/s10389-011-0417-3
- Suárez, C., Manuel, L., Montero, S., Arco, A., Martínez-martínez, A., Manuel, L., & Suárez, C. (2018). *Knowledge Management as a Tool for Improving Business Processes: an Action Research Approac.*
- Sudibjo, N., Aulia, S., & Harsanti, H. R. (2022). Empowering Personal Knowledge Management Among Teachers in Indonesia: A Multi-Faceted Approach using SEM. *SAGE Open*, *12*(1). https://doi.org/10.1177/21582440221085001
- Sullivan, T. M., Limaye, R. J., Mitchell, V., D'Adamo, M., & Baquet, Z. (2015). Leveraging the power of knowledge management to transform global health and development. *Global Health Science and Practice*, *3*(2), 150–162. https://doi.org/10.9745/GHSP-D-14-00228/-/DCSUPPLEMENTAL

- Sundnes, K. O. (2014a). 6. Coordination and control. *Scandinavian Journal of Public Health*, 42(May), 56–75. https://doi.org/10.1177/1403494813515102
- Sundnes, K. O. (2014b). 6. Coordination and control. *Scandinavian Journal of Public Health*, 42(Suppl 14), 56–75. https://doi.org/10.1177/1403494813515102
- Supermane, S., & Mohd Tahir, L. (2018). An overview of knowledge management practice among teachers. *Global Knowledge, Memory and Communication*, 67(8–9), 616–631. https://doi.org/10.1108/GKMC-08-2017-0065
- Sveiby, K. E. (2001). A Knowledge-Based Theory Of The Firm To Guide In Strategy Formulation. *Journal of Intellectual Capital*, 2(4), 344–358.
- Tashfeen, Ahmad. (2017). Knowledge Management for Development: Domains, Strategies and Technologies for Developing Countries. *Integrated Series in Information Systems*, *35*(1), 1– 5.
- Thi Pham, H. (2019). The application of structuration theory in studying collaboration between librarians and academic staff in universities in Australia and Vietnam. *Information Research*, 24(3).
- Thompson, S. M. (2006). *Improving Disaster Response Efforts With Decision Support Systems*. *4*(4). https://doi.org/10.1504/IJEM.2006.011295.This
- Tomé, E., Gromova, E., & Hatch, A. (2022). Knowledge management and COVID-19: Technology, people and processes. *Knowledge and Process Management*, 29(1), 70–78. https://doi.org/10.1002/kpm.1699
- Turrini, A., Cristofoli, D., Frosini, F., & Nasi, G. (2010). Networking literature about determinants of network effectiveness. *Public Administration*, 88(2), 528–550. https://doi.org/10.1111/j.1467-9299.2009.01791.x
- Turyasingura, B., Ayiga, N., Benzougagh, B., Kader, S., Singh, S. K., Bosco, N. J., Gweyi-Onyango, J. P., & Bojago, E. (2023). The complementary role of indigenous knowledge systems in landslide disaster management in Kanungu District, Uganda. *Nova Geodesia*, 3(4), 157. https://doi.org/10.55779/ng34157
- Upadhyaya, S. J. (2008). Coordination in emergency response management (Vol. 51, Issue 5).
- Usuda, Y., Hanashima, M., Sato, R., & Sano, H. (2017). Effects and issues of information sharing system for disaster response. *Journal of Disaster Research*, *12*(5), 1002–1014. https://doi.org/10.20965/jdr.2017.p1002
- Ven, A. H. Van De, Delbecq, A. L., & Koenig, R. (1976). Determinants of Coordination Modes within Organizations. *American Sociological Review*, 41(2), 322. https://doi.org/10.2307/2094477

- Vinson, A. H., Fishstrom, A. B., & Rooney, D. M. (2021). Learning and collaboration during crisis: A novel university-community partnership to manufacture medical personal protective equipment. *International Journal of Environmental Research and Public Health*, *18*(5), 1–10. https://doi.org/10.3390/ijerph18052258
- Vordos, N., Gkika, D. A., Maliaris, G., Tilkeridis, K. E., Antoniou, A., Bandekas, D. V., & Ch. Mitropoulos, A. (2020). How 3D printing and social media tackles the PPE shortage during Covid 19 pandemic. *Safety Science*, *130*(June), 104870. https://doi.org/10.1016/j.ssci.2020.104870
- Wagner, S. M., & Thakur-Weigold, B. (2018). Supporting collaboration in humanitarian supply chains–insights from a design science project. *Production Planning and Control*, 29(14), 1130–1144. https://doi.org/10.1080/09537287.2018.1542175
- Wang, W., & Wang, W. (2009). *Knowledge management adoption in times of crisis*. https://doi.org/10.1108/02635570910948605
- Wankmüller, C., & Reiner, G. (2019). Coordination, cooperation and collaboration in relief supply chain management. In *Journal of Business Economics* (Vol. 90, Issue 2). Springer Berlin Heidelberg. https://doi.org/10.1007/s11573-019-00945-2
- Waring, S., Alison, L., Carter, G., Barrett-Pink, C., Humann, M., Swan, L., & Zilinsky, T. (2018). Information sharing in interteam responses to disaster. *Journal of Occupational and Organizational Psychology*, 91(3), 591–619. https://doi.org/10.1111/joop.12217
- Willis, G. (2014). Managing natural hazard risk in New Zealand towards more resilient communities. Local Government New Zealand, October, 1–64. http://www.lgnz.co.nz/home/our-work/publications/managing-natural-hazard-risk-in-newzealand-towards-more-resilient-communities/
- Wolbers, J., & Boersma, K. (2019). Key Challenges in Crisis Management. The Routledge Companion to Risk, Crisis and Emergency Management, January, 17–34. https://doi.org/10.4324/9781315458175-4
- Wukich, C., Siciliano, M. D., Enia, J., & Boylan, B. (2017). The Formation of Transnational Knowledge Networks on Social Media. *International Public Management Journal*, 20(3), 381–408. https://doi.org/10.1080/10967494.2016.1238428
- Yao, S., & Liu, K. (2022). Actor-Network Theory: Insights into the Study of Social-Ecological Resilience. International Journal of Environmental Research and Public Health, 19(24). https://doi.org/10.3390/ijerph192416704
- Zainol, N. A. M., Taib, K. N., Sofian, M. H., Zahari, H. M., Abidin, Z. Z., & Sarkam, M. K. A. M. (2023). Constructing a Theoretical Framework for Assessing Community Disaster Mitigation

and Preparedness. *Journal of Social Science and Humanities*, *6*(3), 1–6. https://doi.org/10.26666/rmp.jssh.2023.3.1

- Zhang, D., Zhou, L., & Nunamaker Jr, J. F. (2002). A Knowledge Management Framework for the Support of Decision Making in Humanitarian Assistance / Disaster Relief. January 2001, 370–385.
- Zhang, J., Wang, G., & Wang, S. (2019). Command and Control System Construction in Big Data Era. Journal of Physics: Conference Series, 1168(3). https://doi.org/10.1088/1742-6596/1168/3/032022

Appendix 1: Informed consent letter

Dear Participant,

I am Teurai Matekenya, a Doctoral student at the Cape Peninsula University of Technology (South Africa) pursuing a Doctor of Information and Communication Technology (DICT) Degree in the Department of Information Technology, Faculty of Informatics and Design. The title of my research project is: **A KNOWLEDGE MANAGEMENT FRAMEWORK FOR IMPROVING EMERGENCY AND CRISIS RESPONSE IN ZIMBABWE**

You are invited to participate in interviews for this research study. Your contributions are greatly appreciated and are of vital significance to the success of this research. Your response will be analysed together with responses from other participants and will be used to develop the Knowledge Management Framework. There are no risks associated with this study. However, before the interview, I wish to confirm that:

- Your organisation has permitted me to conduct this study.
- Your participation in this study is voluntary and you are free to withdraw at any time.
- Your anonymity will be maintained and no comments will be ascribed to you by name in any written document or verbal presentation. Nor will any data be used from the interview that might identify you to a third party.
- Once completed a copy of the research report will be made available to you upon request.
- The interview will take between 40 to 60 minutes to complete.
- Please click Yes/No to participate in the interview before proceeding

If you have any query concerning the nature of this research or should you have any question/s please feel free to contact my supervisor Professor Ephias Ruhode on email: RuhodeE@cput.ac.za

Your response and time is greatly appreciated. Thank you!

Yours sincerely, Teurai Matekenya

I have read and agree to the conditions: Yes \Box \quad No \Box

Appendix 2 : Letter of authorisation of data collection –DCP

MINISTRY OF LOCAL GOVERNMENT AND PUBLIC WORKS Office of the Secretary Telephone 263 4 707615 P. Bag 7706 Causeway, 263 4 797706 Fax Harare ADM/23/8 ZIMBABWE REF: 20 November 2020 House Number 1928 Westgate, Area D Harare APPROVAL TO UNDERTAKE AN ACADEMIC RESEARCH: MS TEURAL MATEKENYA: CAPE PENINSULA UNIVERSITY OFTECHNOLOGY: STUDENT The above subject matter refers. Please be advised you that the Head of Ministry, in his memorandum dated 28 September 2020, approved your application to undertake a field research on Towards a knowledge Management Framework for improving emergency and crisis response in Southern African Countries: Case of Zimbabwe, Malawi and Mozambique. Kindly be advised that the research findings should not be subject to external consumption and must be solely used for research purposes only. You are required to sign for Official Secrecy before commencement of the research project. In addition, a copy of the field research findings should be submitted to the Office of the Permanent Secretary of this Ministry, upon completion.

It is hoped that the research findings will help this Ministry in coming up with relevant interventions in the study area undertaken.

I. Chazuka FOR: PERMANENT SECRETARY FOR LOCAL GOVERNMENT AND PUBLIC WORKS

Cc: The Director, Civil Protection

Appendix 3 - Letter of authorisation of data collection –Zimbabwe Defence Forces

From the office of the **CHIEF OF STAFF JOINT OPERATIONS & PLANS** Reference Chief of Staff Joint Operations & Plans Zimbabwe Defence Forces Headquarters Private Bag,7713 Causeway Harare, Zimbabwe Telephone: +263 (242) 252052 Ext 2217 +263 (242) 252037 HEADQUARTERS CHIEF CLERK JOINT OPERATIONS & PLANS Def/Jt Ops & Plans/22/4/B 2 6 MAR 2024 March 2024 Attention: Mr Teurai Matekenya REQUEST FOR INTERVIEW IN RESPECT OF DISASTER RESPONSE AND MANAGEMENT BY ZDF Reference: Your letter of request dated 11 March 2024. Receipt of your letter of request for an interview to conduct a research titled "A Knowledge Management Framework for Improving Emergency and Crisis Response in Zimbabwe" is \nereby acknowledged. Authority has been granted for you to interview the target personnel you identified relevant to coordination/management of disaster management activities from both the Zimbabwe National Army and the Air Force of Zimbabwe. Regards. Jaarpank JG MARANGWANDA 'GZM', 'psc' NDU (China), 'ndc' ZW Air Vice Marshal for Commander Zimbabwe Defence Force Mission: To defend the sovereignty, territorial integrity and national interests of the Republic of Zimbabwe and contribute to international peace and security.

Appendix 4 - Letter of authorisation of data collection – Zimbabwe Republic Police

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Official Communications should not be addressed to individuals		GENERAL HEADQUARTERS, BADARE Corner 7th SUbosiah Chinamano Avonu P.O. Box CY 34, CAUSEWAY ZIMBABWE.
Telegrams 'COMPOL':	elephone HARARE 701839	Tolox: 24328 (ZRPHQ): Fax: (263)-(4)-25324
15 April 2024		CHIEF CLERK OPERATIONS
Teurai MATEKENYA		ZIMBABWE REPUBLIC POLICE
89 Beddington Close		1 6 APR 2024
Marlborough		P.O. BOX G AY
HARARE		23.000
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Appendix 5 - Interview guide – DCP [first interview]

Section A: DCP Background

- 1. What is DCP's Vision, Mission?
- 2. Describe the disaster response communication process flow from the time a disaster strikes up to the time emergency responders respond
- 3. List the major stakeholders and their responsibilities that work hand in glove with DCP in responding to emergencies and disasters [flood and cyclone-related disasters].

Sector	Role in response/ res	emergency ponsible for	Contact person	Phone number	Email address

Section B : Current coordination mechanisms and collaboration practices employed by DCP. Potential barriers to effective coordination and collaboration amongst the emergency responders in Zimbabwe.

Process	Question			
Collecting/	1. Who are DCP's major sources of disaster information?			
Acquiring	2. Describe the current system architecture/communication			
	infrastructure in responding to disaster/ what are the popular features			
	of the current system?			
	3. What tools/technologies are used for communicating disaster			
	information?			
	4. Comment on the effectiveness of the methods used for acquiring			
	disaster information			
Storage	4. How is the collected data stored?			
	5. Name and explain any policies and practices governing the retention			
	and storage of disaster information at DCP.			
	6. Are these policies documented and well understood by all the			
	responders to ensure appropriate retention and disposition of			

	information originating in one domain and passed through information				
	sharing.				
Processing/	5. How is the collected information processed?				
Analysing	6. What tools and technologies are used for processing the information				
Sharing	7. How is information conveyed to emergency responders?				
/Communication	8.What communication channels/processes/systems/				
	tools/technologies are used in supporting coordination and				
	collaboration/ information sharing?				
	9. Identify potential gaps in the current information-sharing environment at DCP? If any				
	10. How can the information-sharing gap be improved?				
	 10. Describe how resources are mobilised and how they are distributed to the affected communities. 11. Name and explain any policies and practices governing the sharing of disaster information among responders at DCP 12. Are these policies documented and well understood by all the responders to ensure appropriate retention and disposition of 				
	information originating in one domain and passed through information sharing?				

11. Identify the major trends/issues and events (within DCP) which might impact its crisis response capability

12. Perform a SWOT analysis for DCP

Strengths	Weaknesses
Opportunities	Threats
Appendix 6 - Interview guide – DCP/CPC and DRO

Section A: What are the current coordination mechanisms and collaboration practices employed by DCP?

- What type of communication channels (both formal and informal) do responders use in communicating with DCP/ DDC? What tools and technologies does DCP/DDC use in disseminating disaster information among different stakeholders involved in emergency response?
- 2. Are there any challenges or limitations with the current communication channels?
- 3. What are the policies and practices that govern the retention and storage of disaster information at DCP?
- 4. From your experience, what kinds of knowledge should be easily accessible to assist responders in making good decisions during disaster response?
- 5. Are there processes, methods and mechanisms in place at DCP/DDC to capture and document this knowledge? If yes describe them
- 6. Does DCP facilitate joint training and exercises among responders?
- 7. How does the DCP evaluate the effectiveness of training programs?
- 8. How do DCP's culture and leadership practices affect the effectiveness of disaster coordination and emergency response?
- 9. Does the DCP utilise the ICS in its coordination role? If so, how does its implementation contribute to coordinating and managing emergency response operations?
- 10. Can you please describe the step-by-step process that emergency response agencies follow to request and provide assistance during emergencies, with a specific focus on how Mutual Aid Agreements are implemented?
- 11. What strategies, mechanisms, or practices does the DCP employ to promote and facilitate interagency coordination and collaboration during emergency response efforts?
- 12. Does the DCP have SOPs and guidelines in place for emergency response operations? If yes comment on their effectiveness
- 13. What strategies does the DCP employ to foster a culture of KS among responders?

Section B: What are the potential barriers to effective coordination and information sharing among emergency responders?

- 14. What are the main challenges, limitations, barriers, or hindrances that impact effective disaster coordination and collaboration among emergency responders in Zimbabwe?
- 15. What strategies, measures, or improvements can be implemented to address these challenges and enhance coordination among responders in the country?
- 16. Are there any specific tools or technologies that can facilitate coordination and collaboration among response agencies?

Section C: Visioning

- 17. If you had the authority to shape the DCP in any way you desired, what would your ideal emergency response coordinator look like?
- 18. Write a list of between five and ten concrete steps that you can take in the next several months and/or years to actively create the emergency coordinating organ (DCP) you imagined."

Appendix 7 - Interview guide – community

Section A: To examine current coordination mechanisms and collaboration practices employed by DCP in emergency response.

- 1. How does information flow within the community and to the DDC during a disaster event?
- 2. Are there specific communication channels or networks that the community relies on for sharing critical information during emergencies?
- 3. Are there any challenges or gaps in the existing communication channels, and how can they be improved?
- 4. Describe examples of strategies and practices that the community has developed to help respond to disasters effectively
- 5. Describe if any, traditional practices or IK that have been passed down through generations to cope with disasters.
- 6. How does your community preserve and pass down IK related to cyclones and disaster response from one generation to another?
- 7. What resources, such as equipment, facilities, or skills, does the community possess that can be utilized during emergency and crisis response?
- 8. How can these existing resources and capacities be better integrated into the overall emergency response system?

Section B: To identify the potential barriers to effective coordination and collaboration amongst the emergency responders in Zimbabwe.

- 9. What are the main challenges that the DDC encounter when responding to disasters?
- 10. How has the DCP/DDC addressed or overcome these barriers?
- 11. Are there any cultural or social factors that impact decision-making during emergencies?

Section C: 3. To recommend key Knowledge Management strategies that DCP can implement to ensure effective coordination and collaboration among emergency responders in Zimbabwe.

12. What methods or platforms can be utilized to enhance communication, knowledge sharing and information dissemination within the community during emergencies?

- 13. Are there any specific tools or technologies that can facilitate coordination and collaboration among community members and response agencies?
- 14. How can community members actively contribute their knowledge and insights to improve the overall response efforts?

Appendix 8 - Interview guide – experts (DMA, KM, IT)

Section A: What are the current coordination mechanisms and collaboration practices employed by DCP?

- 1. Can you describe the existing coordination mechanisms and collaboration practices employed by DCPs in emergency response situations in Zimbabwe?
- 2. Are there any ways that coordination and collaboration practices can be improved?

Section B: What are the potential barriers to effective coordination and information sharing among emergency responders?

3. In your opinion, what role does effective communication play in facilitating coordination and collaboration among emergency responders in Zimbabwe? Are there any specific communication challenges that need to be addressed?

Section C: What key KM strategies can DCP implement to ensure effective coordination and collaboration among emergency responders in Zimbabwe?

4. Considering the potential barriers identified, what recommendations would you provide?

Section D: What are the key constructs that guide the development of a Knowledge Management Framework that improves coordination and collaboration among emergency responders in Zimbabwe?

- 5. Which existing theoretical frameworks and models in disaster management can be applied to develop a framework that specifically focuses on gathering, organizing, disseminating, and storing disaster-related information for emergency and crisis response?
- 6. How can these theoretical frameworks and models be utilized to structure the framework for gathering, organizing, disseminating, and systematically storing disaster-related information?

Section E: Visioning

- 7. If you had the authority to shape the DCP in any way you desired, what would your ideal emergency response coordinator look like?
- 8. What institutions and policies should help us get to our preferred outcome?

9. Write a list of between five and ten concrete steps that you can take in the next several months and/or years to actively create the emergency coordinating organ (DCP) you imagined."



Appendix 9 - Zimbabwe coordination architecture