



**THE ROLE OF ANALYTICS IN MANAGEMENT DECISION MAKING WITHIN AN  
ORGANISATION IN THE WESTERN CAPE, SOUTH AFRICA**

by

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## DECLARATION

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## **ABSTRACT**

This mixed methods study examined specific influences on low usage of analytics among level 4 managers in a selected public sector organisation, based on SAP Business Intelligence (SAP BI) log on statistics collected between July 2012 and June 2016. Analytics provides an organisation the ability to enable its management team to make decisions based on facts, rather than assumption. The aim of this interpretivist research, grounded in a subjectivist epistemological position, was to gain an in-depth understanding of the manager's environment and how it influences the usage and adoption of analytics in strategic decision making. Human beings change all the time and the environment in which they find themselves constantly influences them. The main research question was: what specific factors inhibit managers' use of analytics in organisations? A case study approach was deemed the most appropriate for this kind of study because specific environmental factors influence analytics usage. Themes identified as possible factors influencing different dimensions included: individual characteristics, business intelligence systems quality, organisational factors, macro-environment factors, behavioural beliefs and attitudes, effort perceptions, social influence, facilitating conditions and other. For the qualitative component, eight level 4 public sector managers within the selected organisation were interviewed in order to experience the work environment and their interactions with colleagues, while an electronic survey questionnaire yielded data from 211 level 4 managers. The rationale for selecting this category of managers was that they not only manage staff, but also control a budget, and would find it useful to utilise analytics to aid the decision making process. Qualitative and quantitative data analysis methods were used to analyse the data. Dominant themes that emerged from interviews with eight level 4 managers were: organisational factors and system quality characteristics. Daily log on statistics collected from the electronic survey questionnaire yielded quantitative results on usage of analytics within the organisation. Overall, it was found that managers' use of analytics is low. Given the importance of analytics for informed decision-making, recommendations are made to increase usage.

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## GLOSSARY

<b>Terms/Acronyms/Abbreviations</b>	<b>Definition/Explanation</b>
Agile	A method of system development
CIO	Chief Information Officer
DIWK	Data, Information, Knowledge and Wisdom Hierarchy (Koronios & Baškarada, 2013:7)
GIS	Geographical Information System
IPM	Individual Performance Management
IS	Information Systems
IT	Information Technology
Master data	Master data is the core data that is essential to operations in a specific business or business unit (SAP, 2016b)
PSRM	Public Sector Records Management
SAP	Systems Application Protocol (SAP, 2016a)
SAP BI	SAP Business Intelligence
SAP BI-A	SAP Business Intelligence Accelerator
SAP BW	Business Warehouse (SAP, 2016b)
SAP ECC6	SAP ERP Central Component (SAP, 2016c)
SDLC	System Development Lifecycle
Transactional Data	Transaction data always has a time dimension, a numerical value and refers to one or more objects (SAP, 2016b)

## **CHAPTER ONE: INTRODUCTION**

### **1.1 Introduction**

The purpose of this study is to determine what the specific factors are, that influence low management analytics usage. By establishing these factors, the organisation will be in a position to take corrective action if so desired.

The organisation is a public sector concern and its mission is to create an enabling environment for economic growth by creating job opportunities and delivering quality services to all residents.

SAP Business Intelligence is a strategic analytical tool that assists managers to gain insight into business data and enables key intelligent decisions. These decisions are based on facts by using business intelligence rather than on opinion and assumptions. Organisations that use Business Intelligence for corporate reporting have a competitive advantage over their rivals. Business Intelligence within the organisation, covers reporting in the following functional areas: Finance, Human Resource, Logistics, Real Estate, Customer Relations Management, Industry Utility Solutions and Public Sector Records Management.

Grubljesic and Jaklic (2015), Marshall, Mueck and Shockley (2015) and Goldstein (2015) support the notion that business intelligence has positive impacts on decision making within an organisation, particularly in highly competitive environments. They express that a business can move from a reactive to a proactive state if analytics is embraced. They further express that certain factors play a role in users actually accepting, using and taking full advantage of the analytical capabilities within a company.

The organisation implemented SAP Business Intelligence in 2006 with a view to empowering managers in making informed decisions based on facts. The level of analytical maturity has grown over the ten-year period. However, based on statistical data of logon details, one can conclude that usage of analytics amongst managers is low.

### **1.2 Rationale of Research**

#### **1.2.1 Business Background**

The organisation implemented SAP Enterprise Resource Planning in 2002. Four years later, it extended the SAP footprint and implemented SAP Business Intelligence in June 2006 to address the corporate reporting needs of the business. The driver was to assist managers in making more informed decisions by turning

data into easily understandable and actionable intelligence. Business Intelligence usage at the organisation has steadily increased over the years and the level of maturity has grown as managers see the value by enabling informed decision making. In order to further assist managers with ease of use, dashboards were created within the reporting environment. These dashboards are visual in nature and immediately provide the manager with a bird's eye view of the current health status of the organisation.

According to Gartner (2016:n.p.), "business intelligence maturity is classified into four categories - on an increasing scale from information to optimisation:

- Descriptive Analytics: What happened? (Inform)
- Diagnostic Analytics: Why did it happen? (Explore)
- Predictive Analytics: What will happen? (Predict)
- Prescriptive Analytics: How can we make it happen? (Optimise)"

Based on the statistical information gathered, the research points to a low maturity level of management usage of analytics within the organisation and uncovers specific factors influencing analytics usage.

### **1.3 Problem Statement**

#### **1.3.1 What is the Problem?**

While analytical reporting usage is consistent it has been established that a small percentage of managers within the organisation are using analytics. SAP Business Intelligence daily logons have been recorded through SAP Authorisations from July 2012 to June 2016. These logons represent all users, that is, non-management and management logons onto SAP Business Intelligence. A SAP Business Intelligence report has been created to establish the number of managers logging into the system. This percentage split has been determined by using the logon credentials and the related employee master data to establish the position level of the users. These figures represent a small percentage of managers within the organisation that are using analytics. In order to improve efficiency and performance of the organisation, managers need to start consuming analytics, thereby enabling strategic decision making and creating a rich reporting culture within the organisation.

Goldstein (2014:28) reiterates that analytics can move a business from a reactive to a proactive state. Organisations using technology are achieving significantly higher value results. Companies need to automate standardised processes and workflows,

enable cloud processing, optimise analytics, and embrace mobility to enable a competitive and successful advantage.

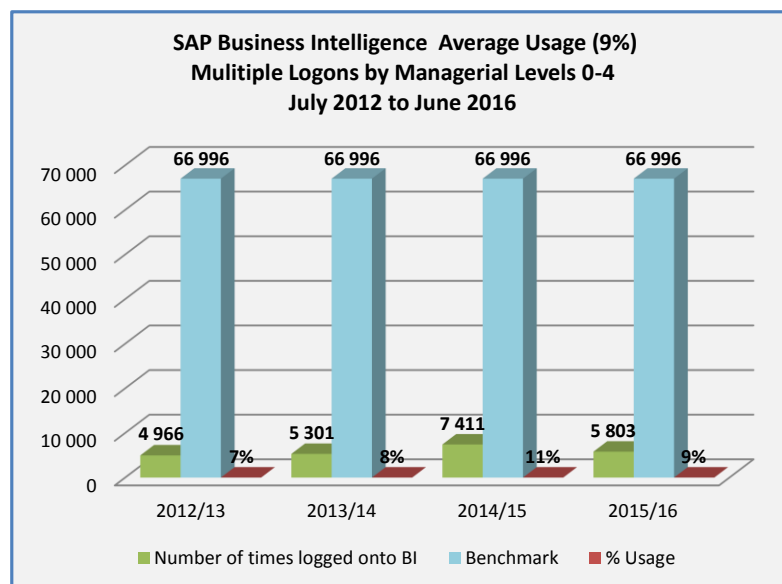
### 1.3.2 How did the problem come about?

Daily statistics of SAP Business Intelligence logon details were collected from July 2012 to June 2016. The managerial compliment is currently 913 positions, of which 823 are occupied. The total managerial compliment has not changed significantly over this period. The consistent overall managerial usage of the analytical tool is on average 9% over the four-year period. This is based on a benchmark of monthly number of logins per occupational category into the SAP Business Intelligence system versus the actual logins of the managerial levels. This benchmark was provided by the Chief Information Officer within the organisation as shown in Table 1-1 below.

**Table 1-1: Benchmark of logins into SAP BI by managerial levels 0-4**

Benchmark logins into SAP Business Intelligence			
Managerial level	Number of employees	Benchmark logins per month	Total benchmark loggings per month
0	1	x0	0
1	9	x0	0
2	54	x4	216
3	235	x5	1175
4	524	x8	4192
Total	823		5583

Figure 1-1 displays a graphical breakdown of the average usage of SAP BI by Management levels 0-4.



**Figure 1-1: Average usage of SAP BI by Management levels 0-4**

For purposes of this case study, focus is on the level 4 managers, as this group of managers should be using SAP Business Intelligence more extensively than managerial levels 0-3, according to the benchmark provided by the CIO. The benchmark for level 4 managers should be a login rate of eight times per month. The top management levels within the organisation range from level 0 to level 4. Level 0 is the city manager (at the highest level), level 1 are the executive directors, level 2 are the directors, level 3 are managers and level 4 are heads.

### **1.3.3 Why should the problem be solved?**

It is likely that the organisation will lose its competitive advantage as well as experience a negative impact on efficiency and service delivery, if managers do not make use of analytics in strategic decision making. For an organisation to succeed, it needs to make decisions based on factual information and this can only be obtained from reliable and accurate analytical reporting.

## **1.4 Research Objectives**

The research explores why managers are not using analytics extensively, given that it has potential to provide a competitive advantage for their directorates, departments and business units.

Specific objectives of the research are:

- To understand the role of business intelligence and business analytics in particular;
- To understand business requirements to implement business intelligence software. These requirements will be both from technical and social imperatives.

## **1.5 Research Questions**

The research questions below relate to the objectives which are to understand business requirements to implement business intelligence software and to understand the role of business intelligence. The research questions are:

- What are the specific factors that inhibit management usage of analytics in organisations?
  - What is the role of business analytics in the organisation?
  - What is management's perception of analytics?

- What are the business requirements to implement software that provides business analytics functions?

## **1.6 Research Design and Methodology**

The researcher was in direct contact with senior managers in order to fully appreciate how they experience the work environment and their interactions with colleagues. An exploratory (interpretivist) approach was adopted in order to find out what is happening, seek new insights and generate ideas for new research; through the participant's perspective (Ellis et al., 2008:21).

The epistemological position is one of Subjectivism with an Interpretive Approach. Human beings change all the time and the environment in which they find themselves constantly influences them. Interpretivists argue that human beings are always influenced by the things that are happening in their environment and therefore react accordingly (Du Plooy-Cilliers, Davis & Bezuidenhout, 2015:23-29).

The approach is inductive involving thick descriptive data. Mixed-methods research, where the aim is for qualitative and quantitative techniques to supplement each other, was used. This approach of using multiple sources of data collection increases the validity and reliability of the study. The qualitative approach draws on interpretive outcomes from interviews and an electronic survey questionnaire. The quantitative approach draws on the daily management logon statistics to the analytical tool and enables the researcher to identify and describe emerging patterns that evolve from the data. The blended approach of qualitative and quantitative techniques confirm and solidifies the results of the study (Du Plooy-Cilliers et al., 2015:33, 204, 228).

## **1.7 Research Population / Site**

The research targeted a sub-set of management, namely level 4 managers, in the selected organisation. The rationale for selecting this category of managers was that they not only manage staff, but also control a budget. This means they would be required to make use of analytics to inform decision making. In addition, the benchmark provided by the CIO for the recommended logins per month for management level 4 is higher than the other managerial levels. The total number of level 4 managerial posts currently occupied is 524.



## **1.8 Data Collection Methods**

Interviews and an electronic survey questionnaire were used to collect information from the level 4 managers of the organisation:

- An electronic survey questionnaire was distributed to 524 level 4 managers spread across the directorates.
- Interviews were conducted with eight level 4 managers across the directorates.
- Daily analytics login statistics for management were used to establish the percentage of managers using SAP BI. This logon information was obtained via SAP Authorisations. A count of daily logons by management was stored and collated for further analysis.

## **1.9 Unit of Analysis**

The researcher will determine the following:

- The unit of analysis for this research was level 4 managers' usage of SAP BI over the period July 2012 to June 2016.

## **1.10 Data Analysis**

Two levels of analysis were employed, briefly described in sections 1.10.1 and 1.10.2.

### **1.10.1 Qualitative Analysis**

Qualitative analysis methods involve the reduction, organisation, interpretation and substantiation of data. The main purpose is to identify themes and patterns embedded in the text. The researcher used thematic analysis with these themes derived from the theoretical framework of Grubljesic and Jaklic (2015). The following themes were explored: individual characteristics, systems quality, organisational factors, macro-environment factors, behavioural beliefs and attitudes, effort perceptions, social influence, facilitating conditions and other.

The data collected from the interviews and electronic survey questionnaire formed a basis for information needed in the analysis and assisted in answering the research questions, namely: what are the specific reasons that influence management analytics usage?

### **1.10.2 Quantitative Analysis**

The researcher drew conclusions from the data sets and determined the statistical significance of the collected data sets, which contain daily management logon statistics for analytics. The findings from the data sets increase the validity and reliability of the study and complement the qualitative outcomes.

### **1.11 Ethical Considerations**

Business Intelligence is a strategic initiative and enhances competitive advantage. As such, it is necessary to keep the identity of the individuals and organisation participating in the study confidential.

In light of this, the organisation where the research was conducted is not “named”. Information obtained through this study remains strictly confidential. Confidentiality was maintained by means of anonymous inputs, no names were used in the statistical data collection.

Participants were informed of the purpose of the research and their consent sought before commencement of the data collection process. They were assured of confidentiality during the data collection process. Codes were used to identify participants and the directorates of the organisation. If any participant felt uncomfortable they could withdraw from the data collection process.

### **1.12 Summary**

This Chapter has described the rationale and the objectives of this research. The problem statement and the main research questions were addressed. The research design, methodology and ethical considerations were discussed. The next Chapter discusses the literature review in the context of business intelligence reporting.

## CHAPTER TWO: LITERATURE REVIEW

### 2.1 Introduction

The previous Chapter looked at the rationale and the objectives of the research. The problem statement and the main research questions were addressed. The research design, methodology and ethical considerations were discussed. This Chapter examines the nature and types of information, the view of information as an asset and how an organisation should protect that asset. It also addresses how manager's accountability to analytics plays a vital role in the strategic process. The researcher will address the factors influencing usage of analytics by managers and the relationship and influence on performance management and efficiency of service delivery within the organisation. Due to this relationship between performance and efficiency of processes, the study also investigates the stages of adoption and maturing levels of reporting and how this influences the reporting culture within the organisation.

Big data and analytics are playing an important role for businesses across all industries in solving business challenges and creating innovation. Leading organisations are capitalising on the collection of new data from both external and internal data sources in an effort to outperform competitors. Companies are able to predict and better meet customer needs by using these data capabilities. This is generating a competitive advantage for these companies (Marshall et al., 2015:32).

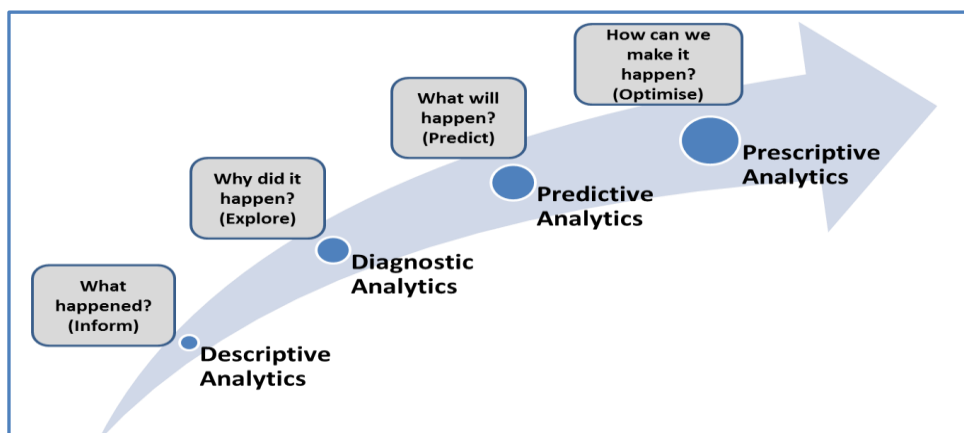
According to Klatt, Schlaefke and Moeller (2011:30), the advancement of business analytics has enhanced performance management systems. These analytical tools enable companies to uncover complex patterns and relationships and support strategic planning. Companies are becoming inundated with information, which is causing information overload. This is due to the development of more substantial data storage opportunities. Regardless of which questions arise in a company's management, there is plenty of data for extensive analysis and multiple answers. This knowledge is the basis for the effective application of analytical tools and efficient decision support to a manager.

What has become evident, is that the uptake and adoption of analytics amongst managers is influenced by a number of factors that can be categorised into the following themes: individual characteristics; business intelligence systems quality; organisational factors; macro-environment factors; behavioural beliefs and attitudes; effort perceptions; social influence and facilitating conditions (Grubljesic & Jaklic, 2015:78).

Good data or analytical tools do not ensure that managers will reach sound decisions. Managers need to be equipped to pose good questions and to interpret the outputs. The data analysis combined with knowledge and judgement comes with years of experience (Gillon, Aral, Lin, Mithas & Zozulia, 2014:34).

According to Gartner (2016:n.p.), “within the model for business intelligence maturity, there are four levels in which an organisation can be classified in terms of levels of information of increasing value to business strategy. On an increasing scale from information to optimisation:

- Descriptive Analytics: What happened? (Inform)
- Diagnostic Analytics: Why did it happen? (Explore)
- Predictive Analytics: What will happen? (Predict)
- Prescriptive Analytics: How can we make it happen? (Optimise)”. This is presented in Figure 2-1.



**Figure 2-1: Gartner's business intelligence maturity categorisation**  
Source: Adapted from Gartner (2016)

The usage of analytics is associated with better performing organisations. While better performing firms do not differ in formal reporting, they differ significantly in comprehension and rational data analysis by decision makers. Lower performing firms acknowledge this competitive advantage and express the desire for intensive application of analytics.

Within the organisation under study, managerial usage of analytics is at a low level of maturity. The organisation went live with SAP Business Intelligence in 2006. The growth has not been substantial as an average of eight percent of management use analytics. The SAP BI logon data has been collected via SAP authorisations and collated from July 2012 to June 2016. The organisation needs to mature in analytical usage in order to gain greater benefits for success. For sustainability, the

organisation needs to determine what the causes are for the low analytics usage, in order to address and turn the situation around.

## **2.2 What is Business Intelligence?**

Companies have built information systems to automate operational processes and, as a result, they have been collecting, storing and maintaining large quantities of data. This data represents years of information about the business' relationships with its customers, yet it has not been leveraged to make informed, bottom-line decisions. Business Intelligence enables this and allows one to group together and format large amounts of business data in an enterprise data warehouse. By analysing the data with analytical tools one can find important information to support the decision-making process in a company. Analytics, therefore, helps optimise business processes and enables one to act quickly and in line with the market, creating a decisive competitive advantage for one's company.

Business analytics is a fast-growing field and there are many tools available in the market to serve the varying needs of organisations. The range of analytical software goes from relatively simple statistical tools in spreadsheets, to statistical software packages, to sophisticated business intelligence suites such as Microsoft, Oracle, SAP and IBM.

Within the organisation under study, SAP Business Intelligence was chosen as the corporate reporting tool. The other reporting packages were available for consideration. However, the organisation had already implemented SAP and, therefore, from a financial and technical integration perspective, the logical analytical tool option was to remain within the SAP suite. A six-month implementation process by an external consulting company took place and SAP Business Intelligence went live in June 2006. A big bang presentation was delivered by the CIO to the managerial team on the strategic benefits of SAP Business Intelligence and to introduce the new reports that had been developed, which were capital and operational reports, service delivery monitoring reports, debt management and payroll / staff costs reports.

## **2.3 Benefits of Business Intelligence**

Timely and effective business information is essential for organisations not only to succeed, but even to survive. Business intelligence provides an organisation with a competitive advantage amongst its competitors and enables financial as well as non-financial benefits, increases operational efficiency and improves decision-

making. This, ultimately, improves service delivery and operational processes. Other business intelligence benefits include:

- Ensuring profitability and increasing liquidity;
- Improving investment communication and decision-making;
- Effective management reporting;
- Increased revenue;
- Better and faster decisions;
- Customer satisfaction;
- Expanding types of analysis;
- Making better insights available to more people;
- One version of the truth; and
- Linking KPIs to corporate objectives.

The organisation under study has benefitted from the SAP Business Intelligence reports. The SAP Business Intelligence inventory of reports has grown to one hundred and sixty, spanning the following functional areas: finance, human resources, customer relationship management, public sector management, logistics, real estate and industry solutions utilities. These are reporting requirements requested by business to the technical SAP Business Intelligence team. There is a wealth of reporting capabilities available to the business and the following benefits have been realised:

Firstly, the finance department has gained time savings of days by having its financial statements automated within the tool. It has a wealth of reports around accounts payable, operating and capital expenditure.

Secondly, the organisational performance management department has enriched reporting and audit requirements. This has been achieved by ensuring that all key performance indicators are substantiated with proof of the values extracted from the SAP Business Intelligence reports.

Thirdly, the revenue department has a view on all aging debt, billing and invoicing and device management information.

Fourthly, the human resources department has benefitted from the wealth of reports around personnel administration, skills development, time management, occupational health and safety and organisational management.

Finally, service delivery reports are highlighting the directorates that are not meeting their service level agreements. Directorates are held accountable and they need to provide remedial action to mitigate poor delivery, resulting in long-term improvements on service delivery. Active measurement results in the work getting

done. Highlighting the inefficiencies creates awareness and a change in behaviour, resulting in a shift in organisational and information culture.

## 2.4 Management Functions

The functions of management consist of five basic activities:

- Planning;
- Organising;
- Motivating;
- Staffing; and
- Controlling.

These activities are important to assess in strategic planning because an organisation should continually capitalise on its management strengths and improve on its management weaknesses.

Analytics will assist management with their day-to-day functions. Management information is an enabler to efficiency, proper planning, organising, controlling and managing of staff. The five functions of management are explained in Table 2-1.

**Table 2-1: The basic functions of management and reporting capability**

<b>The Basic Functions of Management</b>	
Function	Description
Planning	Planning consists of all those managerial activities related to preparing for the future. Specific tasks include forecasting, establishing objectives, devising strategies, developing policies and setting goals.
Organising	Organising includes all those managerial activities that result in a structure of task and authority relationships. Specific areas include organisational design, job specification, coordination, job design, and job analysis.
Motivating	Motivating involves efforts directed towards shaping human behaviour. Specific topics include leadership, communication, work groups, behaviour modification, delegation of authority, job enrichment, job satisfaction, organisational change and managerial morale.
Staffing	Staffing activities cater around personnel or human resource management. Included are wage and salary administration, employee benefits, interviewing, hiring, firing, training, management development, employee safety, affirmative action, union relations, career development, grievance procedures and public relations.
Controlling	Controlling refers to all those managerial activities directed towards the actual results being consistent with the planning results, key areas of control, financial control, inventory control, expense control, analysis of variances and rewards.

Source: Conkright, (2015:17-20)

The use of analytics can assist management to fulfil the roles of planning, organising, motivating, staffing and controlling.

Within the organisation under study, the managerial compliment consists of 913 individuals, of which 823 are currently filled. The management team is the custodian of the employees and responsible for planning, controlling, motivating and providing staffing in their dedicated areas. Management's goal is to increase the productivity of employees and streamline operational efficiencies. SAP Business Intelligence can provide useful information and support around management functions in the form of supporting reports that can provide information around these processes. Management usage of SAP Business Intelligence is eight percent. This figure is based on SAP BI management logon details that have been collected and collated since July 2012. Therefore, one can conclude that the organisation is not capitalising on the wealth of information available to support management functions within the organisation.

#### **2.4.1 Management accountability to analytics**

The previous section described management functions, namely: planning, organising, motivating, staffing and controlling. Analytics assists managers in fulfilling these functions efficiently. In setting the "tone at the top", it is critical for managers to understand why information management is important and communicate this within their functional areas. Managers are responsible for ensuring that their staff are trained and have the requisite skills and understanding to ensure that good information management is adhered to.

Managers need to actively take account of the way in which information is used in their functional areas. Systems must ensure integrity of information captured and managers are accountable for the quality of information that resides in the system. If a manager sees that systems need to be changed, it is their responsibility to highlight the issues and work with the IT department to change them. Monitoring processes is crucial to success and improved information management discipline within the organisation. All managers need to be accountable for process improvement. Management is accountable and responsible for ensuring that the required "tone at the top" is followed within their functional areas of authority for which they are accountable. By managing risks and making sure the growth of information is managed within their area, managers create value from information, while controlling cost and risk.



Decisions made by managers can be based on experience, but it is necessary that decisions are also made on the best information available. Managers must make sure that they have information that allows them to make sound decisions. If the required information is not available or good information is not in place, managers are responsible for correcting this.

Analytics highlight inaccurate data and mature organisations with more developed analytics capabilities acknowledge this. Errors in the data raise awareness and necessity for data clean-up. Corporate culture also poses challenges. Senior management should be committed to analytics and fact-based decision-making. Less mature organisations struggle with a lack of ownership for this vital capability. Senior managers need to support and promote the analytical capabilities and culture within the organisation to ensure sustained growth and success (Chan & Hernandez, 2011:10).

Within the organisation under study, it is evident that the management compliment is not supporting SAP Business Intelligence as is evident in the low usage of the analytical tool. It has been established by the business improvement section that a gap exists between management accountability and technology. The business improvement team has initiated a management accountability programme in an attempt to address this issue and to create awareness amongst managers of the critical role of technology in their respective areas. If one looks at the lack of growth in the usage of SAP Business Intelligence, one can conclude that the message has not been embraced and that managers do not fully understand and support business intelligence.

## **2.5 Information as an Asset**

It is important to think of information as an asset in the organisation and not just a by-product of a particular process (Brother, 2013:6). Like any process involving physical assets an asset needs to be produced to agreed quality standards and then stored appropriately and disposed of when the time is right.

According to Leming (2015:212), information is a vital business asset for any organisation. Information encompasses all, if not most, business activities. It is used to support and inform effective decision making to facilitate ongoing operations and services. With ever increasing information volumes and evolving legal obligations, an organisation needs to identify and mitigate risk, by ensuring that data is suitably protected, readily accessible and properly governed. Assets need to be stored appropriately and then disposed of when the time is right.

Information management should be a central function, cross-cutting of the organisation, subject to controls and given resources in the same way as other functions. This ensures that a consistent approach and vision is embraced that aligns with the overall strategic objectives and goals of the organisation (Leming, 2015:213).

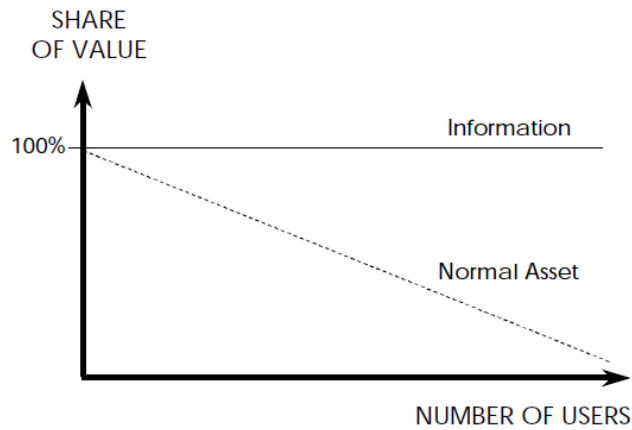
Within the organisation under study, information is viewed as an asset that is important for operational processes. SAP has been implemented and most of the operational processes have been automated within SAP. The Information Technology Directorate recognises information as an asset and has ensured that users are trained before SAP access is granted and access control to systems is gained via authorisations. The organisation has protected the intellectual property, that is, digital information, by securing firewall protection from unauthorised access. SAP Business Intelligence users require training and password protected access is mandatory. Whilst the Information Technology Directorate recognises information as an asset, the business does not necessarily share the same sentiments. This assumption is based on the low management usage of SAP Business Intelligence, an average of eight percent during the period July 2012 to June 2016.

## **2.6 The Nature of Information**

Moody and Walsh (1999:4) state that information has a cost, that is, how much it costs to acquire, store and maintain; and a value, how much it is worth to the organisation. “However information does not obey the same laws of economics that other assets do - it has some unique properties which must be understood in order to be able to measure its value” (Moody & Walsh, 1999:4). There are seven key principles to define the nature of information as an asset:

### Information is shareable

Information is shared between people, business areas and organisations without consequent loss of value to each party. The worldwide web provides the ultimate example of how the same information can be shared by an unlimited number of people. Figure 2-2 displays how the sharing of information increases in value as the number of users increase.

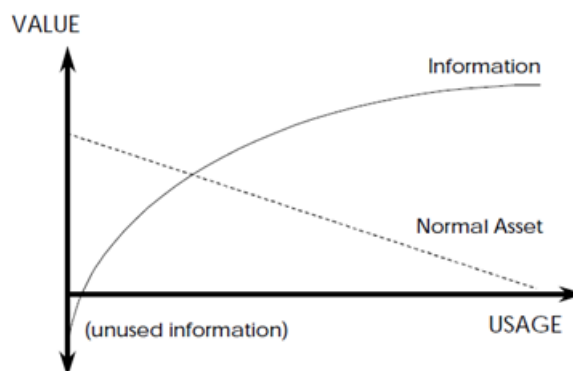


**Figure 2-2: Shareability of information**  
**Source: Moody & Walsh (1999:4)**

Within the organisation under study, the information culture is one of transparency within SAP Business Intelligence. Anyone who has access to the tool and knows how to execute a report will be able to do so for all business areas. Salaries and confidential information are the only areas where information is restricted within SAP Business Intelligence. If managers were actively utilising SAP Business Intelligence and sharing this information, reporting capabilities and strategic decision making within the organisation would increase and add overall value to the business.

- ❑ The value of information increases with use

Information increases in value the more it is used. The major costs of information are in its capture, storage and maintenance - the marginal costs of using it are almost negligible. Figure 2-3 illustrates how the value of information increases with greater usage.



**Figure 2-3: The value of information increases with usage**  
**Source: Moody & Walsh (1999:5)**

“The prerequisites for using information effectively are:

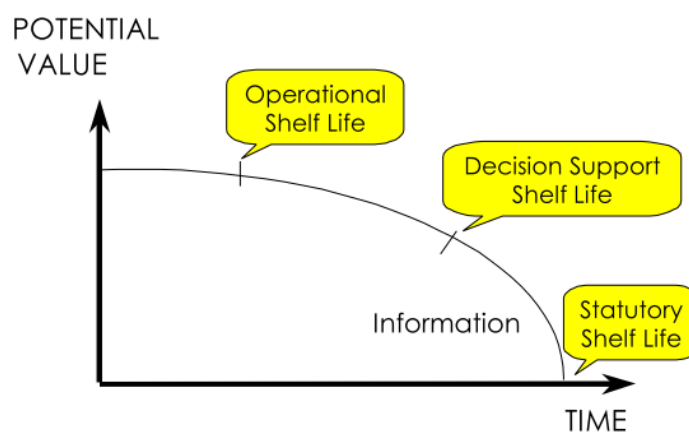
- knowing it exists;
- knowing where it is located;
- having access to it; and
- knowing how to use it”

(Moody & Walsh, 1999:5)

Within the organisation under study, the analytics usage of management levels are low, an average of eight percent from July 2012 to June 2016. There is a wealth of information available to managers which is not being capitalised on and, as a result, is losing its value. If managers made use of information, the organisation would reap the long-term benefits of informed decision making, resulting in a successful and effective organisation.

❑ Information is perishable

The value of information tends to depreciate over time. The speed at which it loses value depends on the type of information. For example, once a customer has changed their address, the old address may be of no importance. However, product sales figures may be relevant for future years. As shown in Figure 2-4, information has three “lives”: an operational shelf life, a decision support shelf life and a statutory shelf life (Moody & Walsh, 1999:6).

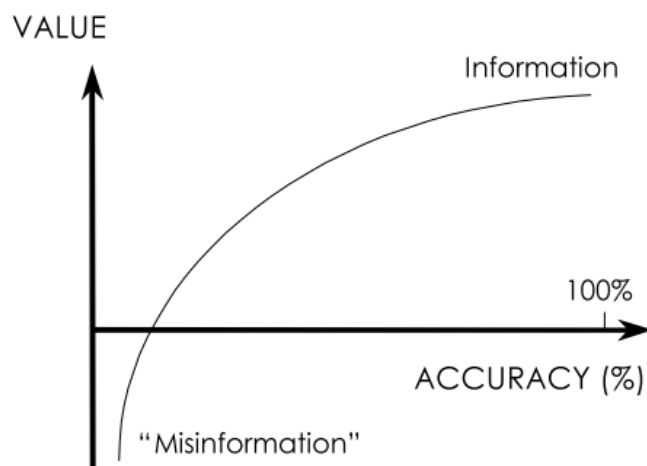


**Figure 2-4: Depreciation of value over time**  
Source: Moody & Walsh (1999:6)

Within the organisation under study, information has a shelf life. The organisation manages and retains its information for administrative, financial, historical or legal reasons. The need for effective management of information is enhanced by a number of Acts. The organisation implemented SAP Public Sector Records and Case Management system (PSRM) in 2007 to store information. Within SAP Business Intelligence, historic data is stored in separate cubes and not archived, enabling users to access historical information, thereby enriching the information and value thereof.

- ❑ The value of information increases with accuracy

The more accurate information is the more useful and, therefore, valuable it is. Inaccurate information can be very costly to an organisation in terms of both operational errors and incorrect decision making. Figure 2-5 displays how information increases in value with accuracy.



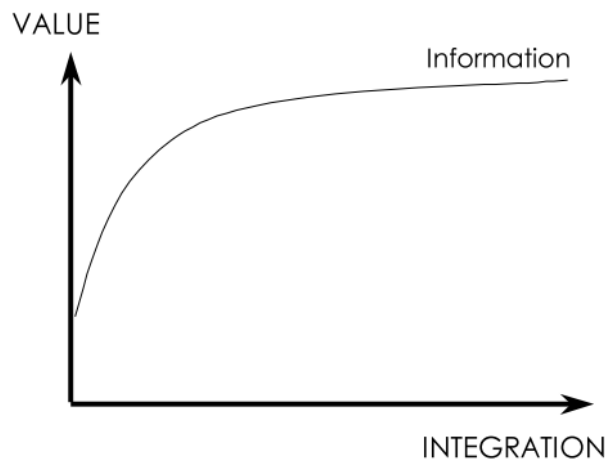
**Figure 2-5: Value increases with accuracy**  
Source: Moody & Walsh (1999:7)

Within the organisation under study, accuracy of information plays an important role in the operations of the Information Technology Directorate as this engenders the credibility of users of the systems. Within SAP ECC6, a daily batch is run to upload all the transactional data of the day. The SAP Business Intelligence batch runs all the transactional data loads from SAP ECC6 system into the SAP Business Intelligence data warehouse. The organisation has batch operators who monitor the batch to ensure that the batch processes do not fail. Managers need to feel confident that the SAP Business Intelligence reports are accurate and that the daily batch has been successful as the information has a direct impact on strategic decision making.

- The value of information increases when combined with other information

Information generally becomes more valuable if it can be compared and combined with other information. For example, customer information and sales information are valuable information sources independently. However, being able to relate the two sets of information is infinitely more valuable from a business viewpoint. Being able to relate customer characteristics with buying patterns can help to target marketing efforts so that the right products are promoted to the right people at the right time.

Producing decision support information generally requires consolidating information from a wide range of different operational sources. The lack of integration of information in operational systems is a major inhibitor to producing decision support information (Moody & Walsh, 1999:8). As shown in Figure 2-6, information value increases with integration.

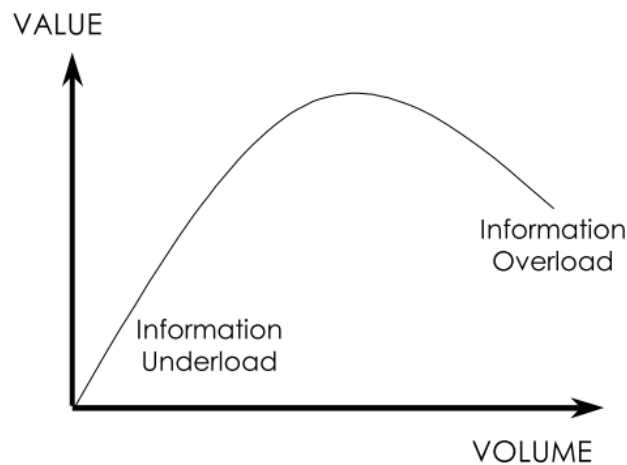


**Figure 2-6: Value increases with integration**  
Source: Moody & Walsh (1999:8)

Within the organisation under study, when information is combined with other sources, its value increases. For example, geo-enablement within SAP Business Intelligence assists managers in viewing information from a spatial perspective. This has value from a political view point to provide a spatial view of service delivery per ward and sub-council. Integration with the Geographical Information System (GIS) enables map layer integration with SAP Business Intelligence to provide great value. There is, however, a lack of awareness among managers of the power and capability that SAP Business Intelligence has to offer.

❑ More is not necessarily better

The more of a certain resource one has, for example, finances, the better off one is. A common management problem is deciding how to allocate limited resources among a number of competing causes. However, with the increasing use of information technology, information is anything but scarce. The biggest problem in most organisations is not the lack of information, but the overabundance of information. Psychological evidence shows that humans have a strictly limited capacity for processing information. When the amount of information exceeds these limits, information overload ensues and comprehension drops rapidly. It has been found in practice that decision-making performance decreases once the amount of information exceeds a certain point (Moody & Walsh, 1999:9). Figure 2-7 illustrates the impacts on information overload versus information under load.



**Figure 2-7: Volume versus value of information**  
Source: Moody & Walsh (1999:9)

Within the organisation under study, information is not archived within SAP Business Intelligence and historical data dates back to 2006. This is available for general consumption, if so desired, and useful for establishing trend analysis. In addition, the reports are created with multiple free characteristics. Free characteristics are additional fields that a user can bring into a report depending on what information the user needs to report on. This may be confusing for inexperienced users where the abundance of information may result in the user abandoning the report and, ultimately, abandoning using the SAP Business Intelligence tool.

❑ Information is not exhaustible

According to Moody and Walsh (1999:9), most resources are depletable - the more one uses, the less one has. However, information is self-generating - the more one

uses it, the more one has. This is because new information is often created as a result of summarising, analysing or combining different information sources. The original information remains and the derived information is added to the existing asset base.

In the context of the organisation under study, information within SAP Business Intelligence can generate more information. Managers may request a report to be developed with multiple views. In addition, reports that are created with multiple free characteristics provide flexibility for the user to bring in additional information into the report as required.

## 2.7 Types of Data

Koronios and Baškarada (2013:6) explore the relationships between Data, Information, Knowledge, Wisdom (DIKW) hierarchy. These concepts of data, information and knowledge are fundamental in basic building blocks of the Information Science field.

Raw data is unprocessed facts without any analysis. Information is data that has been interpreted by the user and has meaning. Knowledge is a combination of information, experience and insight that may benefit the organisation. Koronios and Baškarada (2013:7) explain Data, Information, Knowledge, Wisdom (DIKW) hierarchy relationships in Table 2-2.

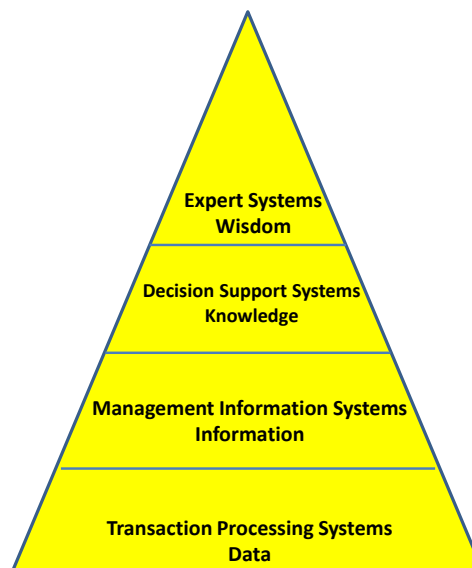
**Table 2-2: Data, information, knowledge and wisdom hierarchy relationship**

Data, Information, Knowledge and Wisdom hierarchy relationship	
Wisdom	<ul style="list-style-type: none"> <li>• Wisdom is accumulated knowledge, which allows one to understand how to apply concepts from one domain to a new situation or problem.</li> <li>• Wisdom is the highest level of abstraction, with vision foresight and the ability to see beyond the horizon.</li> <li>• Wisdom is the ability to act critically or practically in any given situation. It is based on ethical judgement related to an individual's belief system.</li> </ul>
Knowledge	<ul style="list-style-type: none"> <li>• Knowledge is the combination of data and information, to which is added expert opinion, skills, and experience, to result in a valuable asset which can be used to aid decision making.</li> <li>• Knowledge is data and/or information that has been organised and processed to convey understanding, experience, accumulated learning, and expertise as they apply to a current problem or activity.</li> <li>• Knowledge builds on information that is extracted from data. While data is a property of things, knowledge is a property of people that predisposes them to act in a particular way.</li> </ul>



<b>Data, Information, Knowledge and Wisdom hierarchy relationship</b>	
Inform ation	<ul style="list-style-type: none"> <li>• Information is data which adds value to the understanding of a subject.</li> <li>• Information is data that has been shaped into a form that is meaningful and useful to humans.</li> <li>• Information is an aggregation of data that makes decision making easier.</li> </ul>
Data	<ul style="list-style-type: none"> <li>• Data has no meaning or value because it is without context and interpretation.</li> <li>• Data is discrete, objective facts or observations, which are unorganised and unprocessed, and do not convey any specific meaning.</li> <li>• Data items are an elementary and recorded description of things, events, activities and transactions.</li> </ul>

Source: Koronios and Baškarada (2013:7)



**Figure 2-8: The wisdom hierarchy mapping to types of information systems**

Source: Rowley (2007:n.p.)

Figure 2-8 describes the progression of raw data through to wisdom derived from data. This, in turn, provides information to managers which assists in knowledge and, ultimately, is converted to wisdom by managers through the process of rationalisation.

Within the organisation under study, managers need to rationalise and process data, thereby interpreting the data to achieve wisdom in strategic decision making. At an operational level, unit management utilises SAP ECC6 for operational reporting to address day-to-day operations. For tactical decision making, operations and divisional managers utilise SAP ECC6 to support day-to-day business operations. For strategic decisions, executive managers should be utilising SAP Business Intelligence for analytics and drill-down reporting. Based on statistics, a low average

of eight percent of the managers are utilising SAP Business Intelligence for strategic decision making.

### 2.7.1 Master Data and Transactional Data

Data is fundamental to reporting capabilities and data quality is important to user confidence of the extracted information. “Within SAP there are three basic data types, namely, master data, transactional data and historical data. Master data may include clients, customers, products, employees, inventories, suppliers, stores, assets and contracts. Business operations revolve around master data. The data is shared by multiple users, across the entire organisation” (Stephen & Kleiner, 2011:24).

“The three types of data involved in a SAP system are:

- **Master Data.** Application master data tends to be more static once defined. Most master data can be driven by the legacy applications. Examples include vendors, customers, charts of accounts, assets, material masters, info records, etc.
- **Transactional Data.** Transactional data is current and outstanding transaction data that needs to be captured from the legacy system and defined to the SAP ECC6 applications for business process completion. Examples include accounting documents, open purchase orders, open sales orders, etc.
- **Historical Data.** Historical data needs to be brought over from the legacy system to the SAP ECC6 System for reference purposes. Examples include closed purchase orders, closed sales orders, summary general ledger information, etc.” (SAP, 2016b).

Within the organisation under study, master data, transactional data and historical data are the drivers of information reporting within SAP Business Intelligence. Master data is critical to information pertaining to employees, vendors, financial information, project portfolio management, debt management, human resource position, profit centre, cost centre information and capital project information. Transactional data is the day-to-day operations. This information is in the SAP ECC6 system and uploaded into SAP Business Intelligence by means of the daily batch. It is of critical importance that the batch is successful and that it reconciles with the SAP ECC6 system. Historical data within SAP Business Intelligence is moved to different cubes. This ensures that the data is still available for reporting. The current financial year data is performance enhanced with business intelligence accelerator (BI-A). Historical cubes are not enhanced with BI-A. This strategy has

been adopted because BI-A is expensive and a limited amount of space is available for enhancing performance. The technical team ensures that aggregates are loaded on the historical cubes to maintain and improve performance. However, historical cubes with large volumes of data are proving to be slow, resulting in low usage of those specific reports.

## **2.8 Information Security Readiness**

Data and information are valuable assets for an organisation and require appropriate protection. Any decisions about the use and exposure of information need to be based on an understanding of this value and related protection requirements.

The assigned confidentiality levels or classifications, provide an indication of the degree of protection that the information requires and the types and extent of controls needed to implement this protection. Managers are responsible for making sure that data is treated appropriately.

Sun, Ahluwalia and Koong (2011:570), mentions that highly sensitive data, increases the security levels and has a positive impact on information security readiness. For data of low sensitivity, the security level is not necessary.

New challenges have emerged in the task of protecting data in widely networked information systems as more individuals and organisations benefit from the adoption of information and communication technologies and the digitisation of information. These challenges arise because of the ease of duplicating digital information, resulting in an increased likelihood of unauthorised access by cybercriminals. Individuals worry about their privacy and desire complete control over their private data.

Organisations need to protect the data which provide them with competitive advantages in the marketplace. Providing information security is a significant issue confronting IT managers. Organisations face significant challenges as more people are provided access to data stored on networked computer-based systems (Sun et al., 2011:571).

In the organisation studied, computers enhance productivity by making it possible to generate, store and disseminate information. As they are important, they need to be safeguarded against losses, hackers, viruses and misuse. The Information Technology Department takes security of the network seriously. All systems are password-protected and user access is restricted to users who have been trained and assessed. Once they have successfully passed the assessment, they receive

the necessary SAP roles in order to transact within the systems. Passwords need to be changed regularly and have specific criteria to ensure security on the systems. All the production systems are offsite, whilst development and quality assurance clients are onsite to mitigate any risk. Daily backups of these clients are run in the event of a system failure. These systems are core to the operations of the organisation and the Information Technology Department ensures that all systems are secure. To make sure the computers are suitably protected, the Information Technology Department has created a suite of security measures, including anti-virus software for all the desktops and servers.

## **2.9 Corporate Performance Management**

Performance management can be defined as: “A process which is focussed on organisational performance improvement through a number of HR processes, including organisational performance. It establishes shared understanding about what is to be achieved and an approach to leading and developing people which will ensure that it is achieved. Performance management is a process which contributes to the effective management of individuals and teams in order to achieve high levels or organisational performance” (Swanepoel, Erasmus & Schenk, 2008:372-373).

Corporate performance management and individual performance management are necessary tools to grow the organisation and to ensure that service delivery is maintained or exceeded to achieve customer satisfaction and a smoothly run organisation. In order to be successful, organisations need to become and stay world-class in everything they do. An organisation needs to be able to anticipate changing circumstances in the industry. It needs to have the right information at the right time, in order to make the best decisions and take the best actions. It needs to know if strategic goals are going to be met and if it is able to satisfy stakeholders of the organisation. To become and sustain being a world-class organisation, a performance management process is essential. Performance management can be defined as the process that enables an organisation to deliver and sustain value creation (De Waal, 2002:9). The use of analytics is an enabler in sound decision making in these areas.

Within the organisation under study, performance management is conducted at the corporate and individual levels. At a corporate level, the organisation has implemented SAP Strategy Management. This is a performance management tool that provides an overview of strategic focus areas, objectives and key performance indicators. Annual targets are set for the key performance indicators and quarterly actual values are tracked to ensure that the annual target is met. The values

captured as actuals are captured from the supporting SAP Business Intelligence reports.

## 2.10 Theoretical Framework

Factors influencing usage of business analytics can be categorised into the following themes: individual characteristics; business intelligence systems quality; organisational factors; macro-environment factors; behavioural beliefs and attitudes; effort perceptions; social influence and facilitating conditions (Grubljesic & Jaklic, 2015:79). Table 2-3 lists the possible factors influencing business analytics usage.

**Table 2-3: Determinants influencing dimensions of business intelligence usage**

<b>Determinants in usage of business analytics</b>
<b>Individual Characteristics</b>
Age
Computer literacy
Education
Prior experience
Attitude
Computer self-efficacy
Personal innovativeness
Computer anxiety
Readiness for change
<b>Business Intelligence Systems Quality Characteristics</b>
Compatibility
Task-technology fit
Information quality
Output quality
Relevance
System quality
Complexity
Accessibility
Triability
User interface
<b>Organisational Factors</b>
Focus of the customer
Management support
User participation in implementation
Iterative development approach
User training
Organisational culture
Information culture
Change management
Organisational resources
Organisational size

<b>Determinants in usage of business analytics</b>
<b>Macro-Environment Factors</b>
Business sector
Competitiveness of the environment
<b>Behavioural Beliefs and Attitudes</b>
Relative advantage
Job relevance
Perceived usefulness
<b>Effort Perceptions</b>
Ease of use
<b>Social Influence</b>
Voluntariness
Visibility
Image
<b>Facilitating conditions</b>
Facilitating conditions

Source: Grubljesic and Jaklic (2015:77-78)

## 2.10.1 Individual Characteristics

### 2.10.1.1 Age

“Values, attitudes, emotions, perceptions, decision-making, stress and trauma of individuals is all influenced by generational differences of individuals. A generation is defined as a group that shares the same birth years, age, location and important life events at critical development stages” (Hendricks & Cope, 2013:718). Different cohorts think differently, act, work and behave differently, which all has an impact on the readiness adoption and usage of analytics (Cennamo & Gardner, 2008:893).

As time goes by, organisations increasingly have to deal with multiple generations in the pool of human resources (Swanepoel et al., 2008:31-33). Table 2-4 describes the four workforce generations and the shifts in demographic profiles of the workforces over time.

**Table 2-4: Cohorts and work values**

<b>Cohort</b>	<b>Entered the work force</b>	<b>Dominant Work values</b>
Veterans	1950s or early 1960s  Approximate age 65+	Hardworking, conservative, disciplined, team work, respect for authority and seniority driven.  Commitment and loyalty to the organisation.
Boomers	1965-1985  Approximate age mid-40s to mid-60s	Success, achievement, ambition, dislike of authority, loyalty to career. Risk takers.  View work as a means to self-fulfilment. They want

<b>Cohort</b>	<b>Entered the work force</b>	<b>Dominant Work values</b>
		to be noticed for their contribution.
Generation X (Xers)	1985-2000 Approximate age late 20s to early 40s	Work/life balance, team-orientated, dislike of rules, loyalty to relationships. Resilient and adaptable. Open minded. Manages their own time and sets their own limits without supervision.
Millennium Generation (Nexters) Generation Y	2000 to present Approximate age under 30	Confident, financial success, self-radiant but team orientated; loyalty to both self and relationship, comfortable with diversity. Tend to act as a group and are technology dependent.

Source: Nel, Werner, Botha, Du Plessies, Mey, Ngalo, Poisat & Van Hoek (2014:441); Hendricks and Cope (2012:719-720)

Generation Y think differently, behave differently and have different aspirations. They look for instant gratification, have no loyalties to employers who give nothing back, and will easily change jobs if they are dissatisfied in an organisation. Generation Y value work/life balance, seek career development, have grown up with computers/technology and travel more than other generations. They also value intrinsic aspects of work such as mentoring and training in order to be marketable (Cennamo & Gardner, 2008:893).

Generation X are individualistic and do not align themselves to a team. They manage their own time, set their own limits and get their work done without supervision. Baby Boomers need personal fulfilment and self-worth and are competitive. Boomers want to be noticed and valued for their contributions (Hendricks & Cope, 2012:717-719).

Generation Y possess the characteristics needed for leaders of the future, which are:

- Comfortable with technology, diversity and change
- Familiarity with a complex mix of routine and non-routine tasks
- Flexible, multi-skilled risk takers who can multitask
- The attitude “a job for life” is not in their mind-set.

(Nel et al., 2014:442)

Differences between generations are theorised to occur because of major influences in the environment within which early human socialisation occurs; influences that impact on the development of personality, values, beliefs and expectations that, once formed, are stable into adulthood (Macky, Gardner & Forsyth, 2008:858).

Coaching and mentoring is a useful tool to bring out the best in people's capabilities and to encourage team cohesion. Veterans would prefer a traditional seniority-based one-one-one coaching style. Boomers would prefer being coached in peer-to-peer situations. These coaching and mentoring sessions could encourage acceptance and/or understanding the viewpoints of the different generational cohorts, thereby creating mutual respect of the teams, valuing diversity and focussing on the strengths of each generation (Hendricks & Cope, 2012:717-725).

As humans we do not adapt well to change. In order to effect change, managers need to develop a change vision and strategy. They need to communicate to staff to create understanding and buy-in. Managers need to remove barriers in order to make the vision happen. Managers need to hold onto the new ways of behaving until they replace the old traditions. They need to think, feel and act differently to make change happen. This change process is gradual and, typically, will not be an overnight change within the organisation (Smith, 2011:115-116).

#### **2.10.1.2 Computer literacy**

Literacy is a demonstrated competence in communication skills, which enables the individual to function, appropriate to their age. Managers need to have computers in order to function effectively within the role and involves whatever understanding, skills and attitudes one needs to function in this specific role (Bawden, 2001:225). Usage and adoption of analytics will be a smoother transition if managers feel comfortable and competent in utilising a computer.

#### **2.10.1.3 Education**

Developing countries are attempting to enhance the profile and development of business education and graduate entrepreneurship as an important source of national competitiveness and economic growth. The organisation requires graduate-level education for its management team and is raising the bar of excellence. Organisations needs to develop graduate management capabilities to enable and contribute to this growth in order to maintain a competitive advantage (Nabi & Liñán, 2011:327). Education is the building block of a sound, competent and successful management force. Education creates the foundation of growth and openness to learning new technologies which, ultimately, places an organisation in a strong position.



#### **2.10.1.4 Prior experience**

Many factors contribute towards management capabilities, such as personality, beliefs, culture, values, demographics, education, past experiences, psychological factors and social networks.

Prior knowledge about markets, customer problems and knowledge about how to serve markets will influence an individual's discovery of opportunities (Quan, 2012:947). Prior experience extends management competence, as managers have been exposed to other facets of business. As a result, these managers may be more open and willing to utilising analytics to unleash further potential for the organisation.

#### **2.10.1.5 Attitude**

Attitudes of individuals are feelings, thoughts and predispositions to act towards some aspect of an individual's environment. Attitudes reflect a person's tendency to feel, think or behave in a positive or negative manner. Attitudes can be received with excitement or fear and employees' response to it may be positive or negative (Vakola & Nikolaou, 2005:162). Attitude will impact an individual's response to analytics and the perceived benefits thereof. Managers who have a positive attitude to the work environment are more responsive to utilising analytics.

#### **2.10.1.6 Computer self-efficacy**

Employees who believe they can exhibit the behaviour required for specific situations are more likely to set challenging goals, engage in proactive work behaviour and, consequently, perform better than employees with lower self-efficacy. Employees' self-efficacy is an important precursor of positive work-related well-being, such as health and job satisfaction. Computer self-efficacy deals with individuals feeling confident to use the computer system tools available within an organisation (Van Seggelen & Van Dam, 2015:18).

#### **2.10.1.7 Personal innovativeness**

Innovation arises when decision makers notice a performance gap or perceive that the organisation's present course is unsatisfactory. The identification of innovative improvements and the attitude to embrace change results in an increase in the organisation's quality levels (Carneiro, 2006:308). Managers with innovative predispositions are more open to utilising analytics or a new computer system tool.

### **2.10.1.8 Computer anxiety**

The computer is viewed as a tool for simplifying and enriching lives. However, many individuals react negatively to this technology with feelings of anxiety, paranoia and alienation. Fear of computers reflects a generalised fear of current technology and is most prevalent in already anxious individuals. Individuals who express fear of technology will be closed to the usage of any computer system tool and, as a result, this will have a negative knock-on effect within the organisation (Venkatesh & Bala, 2008:279).

### **2.10.1.9 Readiness for change**

The readiness and openness of managers to change allows for new opportunities and growth. Personal innovativeness and readiness for change are important for the transition from using a system occasionally to routine usage. Readiness for change is the extent to which an individual holds positive views about the need for change and believes that changes are likely to have positive implications (Grubljesic & Jaklic, 2015:79).

## **2.10.2 Business Intelligence Systems Quality Characteristics**

### **2.10.2.1 Compatibility**

Compatibility addresses integration with third party source systems. This enables the analytics capabilities to extract information from third party sources systems, enriching reporting within an organisation (Karahanna et al., 1999:188).

### **2.10.2.2 Information quality**

Almost all activities in organisations involve the use of data, which is the foundation for operational, tactical and strategic decisions. Therefore, if a company aims for efficiency, it is critically important that the company's data is of adequate quality to ensure the company's success (Haug & Arlbjørn, 2011:288-289). Analytics becomes more entrenched and accepted by managers only if information is of sound quality. If the accuracy and security of a company's data are in doubt, stakeholders will lose confidence, trading will be affected and performance will suffer.

### **2.10.2.3 Output quality**

SAP Business Intelligence's data source system is the ERP system and draws its data from there. Reporting may be skewed if data is of poor quality. Garbage in, produces garbage out. Therefore, the impacts are huge on reporting if data quality is of poor quality. Accurate information is more useful and therefore the more valuable it becomes (Venkatesh & Bala, 2008:294).

### **2.10.2.4 Relevance**

Performance perceptions such as relative advantage, job relevance and perceived usefulness are important expansions for analytics usage. The extent to which people require information and the availability of the reports are incentives for utilising analytics (Grubljesic & Jaklic, 2015:79).

### **2.10.2.5 System quality**

System design quality ensures that users are able to access systems in a more user-friendly manner. Quality determinants, such as the system being clear, intuitive, responsive, flexible in design and simple to use, are key in order to meet users' requirements. Navigation, searching and retrieval of information are important elements in system quality design (Saha, Nath & Salehi-Sangari, 2012:303). Management usage of analytics will increase if all the quality determinants are adequately catered for.

#### **2.10.2.5.1 Execution response times of reports**

Analytical report execution times can be slow if data volumes are large. This may have an impact on analytics usage. Humans, by nature, are impatient and slow response times may well hinder analytics usage. Companies have various performance enhancement tools available for implementation to address poor performance issues; however, these tools are costly. There is an improved uptake of analytics as a result of faster performing reports and dashboards, increased user acceptance and an overall positive experience and buy-in of the toolset.

### **2.10.2.6 Complexity**

Complexity is how easy or simple the system is to use. Complexity supplements training and how the individual perceives the difficulty or ease of utilising the said

system. Managers will embrace the system if it is simple to use and, therefore, facilitates decision making within the organisation (Grubljesic & Jaklic, 2015:79).

#### **2.10.2.7 Accessibility**

Accessibility is the access and prerequisites that managers require to operate and utilise the analytical tools of the organisation. If the administrative process for gaining analytical access is cumbersome it will, possibly, hinder users in applying for the access to the system (Grubljesic & Jaklic, 2015:72).

#### **2.10.2.8 Trialability**

Trialability is the degree to which an innovation may be experimented with on a limited basis. It is important to the success of an organisation that managers make use of analytics as this informs decision making. The first exposure to analytics needs to be a positive experience to aid the transition from using the system on a trial basis to embedding it in the user's long-term usage (Karahanna et al., 1999:183).

#### **2.10.2.9 User interface**

This supplements the design of the said system. The user interface should be user-friendly, easy to use, easy to learn, quick access and response times, well organised and clear design and visually attractive. All these elements will enable an environment that users are willing and keen to use technological tools (Saha et al., 2012:305).

### **2.10.3 Organisational Factors**

#### **2.10.3.1 Focus on the Customer**

Organisations need to align operations with customers' needs and anticipate future needs. They need to design products and services that are easy to use by target customers and employ technology to create new market segments. Customer-focused IT represents a shift in organisational culture, shifting the focus and treating customers as key stakeholders of the organisation (Narayanan, 2015:15-16).

Customer focus is integral for the success of most businesses. Businesses need to establish the needs and desires of their customers in order to create demand for

goods and services and to ensure sustainability of the business. Analytics will assist in establishing customers' needs and desires.

### ***2.10.3.2 Management Support***

The key to entrenching analytics in the organisation is leadership support at the senior management levels. Senior leaders need to promote and sanction analytical orientation. Managers need to implement rewards to facilitate continuous analytical usage. Management support of analytics is crucial for sustained use of analytical tools. If management support of business analytics is evident, that is, managers draw financial, tactical and operational reports and conduct their business with decisions based on this information, the tone of the reporting culture is set from the top and the staff are "encouraged" to use analytics. Directors also play an important role in acceptance of the system by changing the way regular board meetings are to be conducted, which should include a review of the status of the efficiency and effectiveness indicators through analytics. CIOs need to insist upon concentrating the resources of the organisation on this goal of analytics usage to, ultimately, create a cutting-edge organisation.

Organisations need to understand the power of training employees in analytics. As part of an analytics project, to extract more value from its data, regular employee training sessions are necessary. Leaders should make analytics a key competency for all employees and add analytics-related objectives to employee goals (Narayanan, 2015:16).

### ***2.10.3.3 User participation in implementation***

Business involvement in the implementation of any IT functionality or software is critical to the buy-in and uptake from business of the new toolset. The technical team needs to engage and include business to ensure that business processes are adequately catered for. Failed implementation is often a result of lack of business and stakeholder engagement and involvement. Narayanan (2015:16) reiterates that IT professionals need to engage with product development and service delivery operations. They need to interact with actual customers, that is, the users of the reports and dashboards, in order to achieve successful implementations.

### ***2.10.3.4 Iterative development approach***

System development lifecycle (SDLC) consists of several phases of analysis and design, which must be followed sequentially in the development of an information

system. SDLC includes the following phases: planning, analysis, design, implementation and support. SDLC methods are lengthy, expensive and inflexible. Systems developed on the SDLC model are unable to adapt to rapidly changing user requirements. To overcome these challenges, alternative methods have emerged, known as agile methods. The goal of agile methods is for fast development of software to satisfy user requirements (Oz & Jones, 2008:422).

Report creation involves a two-pronged approach. Business and IT need to work closely together in establishing business requirements. Users do not always express their requirements clearly and, as a result, scope creep and iterative development approaches to reports occur. Agile methods are typically used when users cannot communicate their requirements, either because they are not familiar with technological developments or because they find it hard to conceptualise the system's input and output files, processes and user interface (Oz & Jones, 2008:409-424). Timeously addressing the reporting requirements of users will prevent usage of other unreliable sources of information.

#### **2.10.3.5 User Training**

Global competition, the changing marketplace and rapid technological advances require a more competent workforce. Organisational training should be recognised as a strategic force in an effort to raise competitiveness. Training is needed to improve skills in order to help organisations achieve their goals and create a competitive advantage. This is achieved by adding value to employees. With high training investments, organisations need to justify training effectiveness. This requires tracking and documenting that employees can use the skills learnt in their work environment.

User training is critical to any information technology roll-out and is a key milestone to one of the project success components. Trained and competent users embrace the tool and are champions within the business.

Du Toit, Erasmus and Strydom (2010:326) reiterates that training can be a strong motivational force since it is critical to an individual's growth. Providing opportunities for skills development and transfer of knowledge is regarded as an important strategy and contributes to a promising company's competitive edge. To help make analytics and innovation a part of every role, organisations can build skills, cross-train and innovate teams by creating networks with shared objectives.

Multi-media software training is rapidly replacing training programmes involving classrooms and teachers. Such applications include interactive, three-dimensional

simulated environments. Training software simulates situations in which an employee must act and includes tests to evaluate a trainee's performance. In addition to the savings in trainer's time, there are other benefits. The trainee is more comfortable because they control the speed at which the session is run. The software lets the trainee go back to a certain point in the session if a concept has been missed (Oz & Jones, 2008:110). Users who are properly trained will feel competent and confident to use the tool.

#### **2.10.3.6 Organisational Culture**

Organisational culture is a set of important shared understandings (mostly unstated) between members of the organisation. These consist of such things as the values, attitudes and mindsets of members in the organisation. It is essentially sharing ideas about "who we are, what we stand for and how we do things around here". Managers who wish to change organisational culture need to acknowledge that cultural changes can present challenges. Changing culture is usually more difficult than changing systems and structures because it revolves around deeper issues such as values and mindsets. Bringing about change in culture requires multidimensional interventions that cover different foci in organisations - including, structures, systems and technology (Swanepoel et al., 2008:23).

#### **2.10.3.7 Information Culture**

Grubljesic and Jaklic (2015:76) identify six information behaviours that characterise the information culture of an organisation: information integrity, informality, control, sharing, transparency and proactiveness. An open information culture involving the sharing of information is particularly important for analytical use. Openness in reporting and the presentation of information on errors and failures is emphasised, thus making information transparency and information proactiveness relevant in order to respond quickly to business changes. Managers will make use of analytics if the environment fosters and nurtures sharing and transparency of information.

#### **2.10.3.8 Information Integrity**

According to Moody and Walsh (1999:7), the more accurate information is, the more useful and valuable it is. Inaccurate information can be very costly to an organisation in terms of both operational errors and incorrect decision making.

Almost all activities in organisations involve the use of data, which is the foundation for operational, tactical and strategic decisions. Therefore, if a company aims for efficiency, it is critically important that the data of the company is of adequate quality, that is, high-quality data is crucial to a company's success (Haug & Arlbjørn, 2011:288). Unfortunately, data quality is an area which many companies seem to overlook or give insufficient attention to (Marsh, 2005:105).

“There seems to be a general consensus that poor quality data is a costly problem for many companies. The main barriers to overall data quality are:

- Lack of delegation of responsibilities for maintenance of master data;
- Lack of rewards for ensuring valid master data;
- Lack of master data control routines;
- Lack of employee competencies; and
- Lack of user-friendliness of the software that are used to manage master data” (Knapp & Hasibether, 2011:1-8).

#### **2.10.3.9 Change Management**

As humans we typically do not adapt well to change. In order to change, managers need to develop a change vision and strategy. They need to communicate to staff to create understanding and buy-in. Managers need to remove barriers in order to make the vision happen. Then one needs to hold onto the new ways of behaving until we replace the old traditions. We need to think, feel and act differently to make change happen (Smith, 2011:116).

Change management requires that when organisational change occurs, the climate must be conducive to the change. Employee understanding, participation and support are needed, and some of the changes need to be incremental, step-by-step and congruent with the existing culture in order to maintain some form of stability (Swanepoel et al., 2008:717). Change management in analytics is a journey whereby management need to slowly entrench the reporting culture through awareness and participation within the organisation.

#### **2.10.3.10 Resistance to Change**

According to Kim (2011:471), the results of previous research indicate that up to 70% of information systems implementation projects have failed. One study found that approximately 80-90% of all information systems implementation projects fail to meet all of their objectives. The failure rate of enterprise systems



implementation is particularly high. Enterprise systems are large-scale, integrated application-software packages that are used to support business processes, information flows, reporting and data analytics within complex organisations. User resistance to change in enterprise system implementation has been identified as one of the most critical reasons for the high failure rates of IS implementation projects. User resistance can be destructive if it generates conflict and consumes excessive resources, but can be constructive if it reveals weaknesses in the system being implemented (Kim, 2011:471).

Employees tend to have invested a lot of time and effort mastering the current methods, for example, the use of current software and the performance of tasks. The implementation of a new enterprise system may require changes in their ways of working, for example, new tasks, which negates the investments already made and, therefore, leads to user resistance (Kim, 2011:478).

Managers encountering employee resistance need to re-evaluate their strategies after determining the actual causes of resistance, and then remain flexible enough to overcome the resistance in an appropriate manner. In order for an organisation to effectively manage resistance to change, a number of areas need to be considered:

- Education and communication;
- Participation and involvement;
- Facilitation and support;
- Negotiation and agreement;
- Manipulation and co-option; and
- Explicit and implicit coercion (Swanepoel et al., 2008:716).

#### **2.10.3.11 Organisation resources / organisational size**

The type of systems that organisations can afford depends on the size and financial resources available to the organisation. Computer systems can be costly. As such, the business requirements need to be supported to justify the financial outlay. It is critical that a company reaps returns on investment by ensuring that employees actively utilise the systems in order to gain from the financial and non-financial benefits from the system.

## **2.10.4 Macro-Environment Factors**

### **2.10.4.1 Business Sector / Competitiveness of the Environment**

Public sector and private sector organisations have fundamental differences in the way business is conducted. The private sector is more driven by the bottom line, which is, making profits for stakeholders, whilst the public sector organisations are more people focused. Public sector organisations do not have the same strategic freedom private companies have since most of their strategic goals are decided by the current government.

The use of analytics for private sector organisations is critical in analysing market and customer trends, thereby creating a competitive edge for the company. Consequently, the drive for analytics is crucial to the survival of the private sector.

An important part of an external audit for private sector businesses is identifying rival firms and determining their strengths, weaknesses, capabilities, opportunities, threats, objectives and strategies. Collecting and evaluating information on competitors is essential for successful strategy formulation. There is an increasing emphasis on competitive analysis, which includes planning, collecting data, analysing data, facilitating the process of gathering and analysing data, disseminating intelligence on a timely basis, researching special issues, and recognising what information is important and who needs to know (David & David, 2015:239).

The public sector's core focus is delivering services such as water, electricity, waste removal, sanitation, new infrastructure, roads, public spaces, facilities, housing developments, upgrading informal settlements and existing infrastructure, and clinics. Effective service delivery requires an administration with institutional knowledge, expertise, experience, financial sustainability, a 'can do' attitude and good governance measures. The usage of analytics within the public sector is not as big a driver as in the private sector. The organisation under study is a public sector concern. If analytics usage were extensive, it could improve and address service delivery, meet the future needs of its residents, assist in decision making around development and faster growth opportunities.

## **2.10.5 Behavioural Beliefs and Attitudes**

### **2.10.5.1 Relative advantage / Job Relevance**

Performance perceptions such as relative advantage, job relevance and perceived usefulness are important expansions for analytics usage. The extent to which

people compete with each other in the usage of analytics, that is, who will be better and who will be able to quickly locate the necessary information, play a role in analytics usage.

The usage of analytics is primarily optional in comparison with an operational IS where use is mostly mandatory for carrying out the business process. Analytics users are generally more educated workers, mostly managers within the organisation. The information collected is more aggregated at the level of the entire organisation and there is more sharing of information. The information needs of operational IS primarily derive from processes that are more structured and well-defined at the operational level and, thus, the information needs are better defined, while in analytics they are much less structured and the needs are often ad-hoc in nature. Consequently, the methods used to identify the information needs of operational IS are much more defined and based on defining and modelling of processes, while with analytics the identification of needs are based on performance management and the efficiency of operations.

Compared to operational IS the benefits of analytics are much more indirect and long-term, which may negatively affect their perceived usefulness and, consequently, their acceptance and use (Grubljesic & Jaklic, 2015:79). Managers are key decision makers and reporting requirements are necessary aspects of the job function. As such, due to job relevance, the usage of analytics should be mandatory.

## **2.10.6 Effort Perceptions**

Ease of use ties in closely with user training in the analytical toolsets. Effective training results in users feeling more comfortable with navigation within the tool. If the perception of users is that the toolset is easy to drive, the uptake of analytics increases.

## **2.10.7 Social Influence**

### **2.10.7.1 Voluntariness**

Social psychologists have long recognised how strongly social influences motivate human behaviour. The support of managers, for example, is a critical social influence on workers' attitudes to information systems and their willingness or voluntariness to use a system (Klobas & Clyde, 2001:62). Setting the tone at the top

creates an environment of users volunteering to use analytics in their day-to-day reporting.

#### **2.10.7.2 Visibility / Image**

Managers need to be setting the tone from the top and actively managing their areas using analytical tools in order to create an environment for staff to follow suit. Managers can create visibility by promoting usage of the toolset. Staff follow the lead set by the example of managers.

#### **2.10.8 Facilitating Conditions**

Facilitating conditions entail that the environment is conducive for business learning and adoption of new skillsets. It revolves around the training and technical support for end users within the business environment to use the said system. If support is available it is easier and conducive for management to use the analytical tool (Grubljesic & Jaklic, 2015:79).

### **2.11 Summary**

In this Chapter, the literature review was outlined positioning the importance of analytics in the various business areas and its impacts on management functions and decision making. It addressed the value of analytics and how it should be viewed as an asset and therefore protected. The nature of information was unpacked highlighting that the more it is used the more valuable it becomes. It also addressed the theoretical framework which underpins this case study in answering the research questions, namely, what are the factors that influence the usage of analytics amongst managers. The various factors that influence analytics usage is individual characteristics, system quality characteristics, organisational factors, macro-environment factors, behaviour beliefs and attitudes, effort perception, social influence, facilitating conditions and other. The next Chapter examines research methodology. The approach, strategy and methods used will be unpacked in detail.

## CHAPTER THREE: RESEARCH METHODOLOGY

### 3.1 Introduction

The previous Chapter positioned the literature review and outlined the importance of analytics in the various business areas and its impacts on management functions and decision making. It addressed the value of analytics and how it should be viewed as an asset and therefore protected. The nature of information was unpacked. It also addressed the factors that influence the usage of analytics amongst managers. In this Chapter, the research methodology followed in this study is discussed. The research methodology of the study is also described further in terms of the research methods that were used. The Chapter also defines the scope and limitation of the research design and positions the research approach and methodology used in the study by examining the usage of analytics by management within the organisation. The philosophical assumptions underpinning this research comes from the interpretive school of thought which is explained in the next sections. Figure 3-1 displays the research methodology process flow approach.

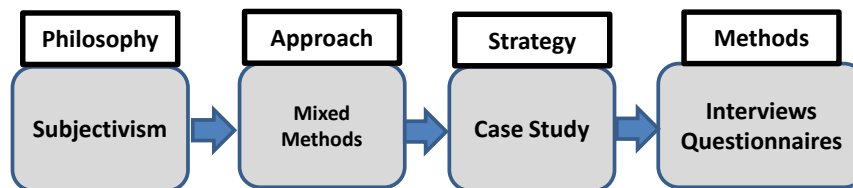


Figure 3-1: Research methodology

### 3.2 Research Philosophy

The researcher's epistemological position is one of Subjectivism with an Interpretive Approach. Human beings change all the time and the environment in which they find themselves constantly influences them. Interpretivists argue that human beings are always influenced by the things that are happening in their environment and therefore react accordingly. In this case study, there are specific factors in the environment that influence analytics usage and the researcher intends to tease out these specific factors through the study of knowledge in the analytics usage arena. The aim of the interpretivist research is to gain an in-depth understanding of the manager's environment and how it influences the usage and adoption of analytics in strategic decision making. The researcher will spend direct contact with senior managers in order to fully appreciate how they experience the work environment and their interactions with their fellow colleagues (Du Plooy-Cilliers et al., 2015:23-29).

### **3.3 Research Approach**

The approach is inductive involving thick descriptive data. Mixed-methods research, where the aim is for qualitative and quantitative techniques to supplement each other, was used. This approach of using multiple sources of data collection increases the validity and reliability of the study. The qualitative approach draws on interpretive outcomes from interviews and an electronic survey questionnaire. The quantitative approach draws on the daily management logon statistics to the analytical tool and enables the researcher to identify and describe emerging patterns that evolve from the data. The blended approaches of qualitative and quantitative techniques confirm and solidify the results of the study. Therefore, this blended approach removes the guess work from the interpretation of data. The researcher will explore and obtain a better understanding of the specific situation based on these outcomes (Du Plooy-Cilliers et al., 2015:33, 204, 228).

### **3.4 Strategy**

A case study method was chosen to satisfy the needs of the research to address the practice-based problems where the experiences of the participants are important (Ellis, Levy & Lauderdale, 2008:21). Through case study research the researcher becomes part of the real-life world of practice, even if the researcher's role is only that of an observer. The researcher was in direct contact with senior managers in order to fully appreciate how they experience the work environment and their interactions with colleagues. An exploratory (interpretivist) approach was adopted in order to find out what is happening, seek new insights and generate ideas for new research; through the participant's perspective (Ellis et al., 2008:21).

### **3.5 Research Population / Site**

The research targeted a sub-set of management, namely level 4 managers, in the selected organisation. The rationale for selecting this category of managers was that they not only manage staff, but also control a budget. This means they would be required to make use of analytics to inform decision making. In addition, the benchmark provided by the CIO for the recommended logins per month for management level 4 is higher than the other managerial levels. The total number of level 4 managerial posts currently occupied is 524. Table 3-1 provides an employee breakdown of the managerial levels:

**Table 3-1: Managerial level compliment as at 2016/17**

Managerial level	Number of employees	Sum of Posts
0	1	1
1	9	11
2	54	62
3	235	255
4	524	584
Total	823	913

### **3.6 Data Collection Methods**

Interviews and an electronic survey questionnaire were used to collect information from the level 4 managers of the organisation.

- An electronic survey questionnaire was distributed to 524 level 4 managers spread across the directorates. The time to complete the electronic survey questionnaire was approximately five minutes. Two hundred and eleven managers responded to the electronic survey questionnaire. The electronic survey questionnaire has a 97.5% confidence level and a 5.2% margin of error. A confidence level describes how sure one can be that one's results are accurate, whereas the margin of error shows the range the survey results would fall between if our confidence level held true. A standard survey will usually have a confidence level of 95% and margin of error of 5%.
- Interviews were conducted with eight level 4 managers across the directorates. The interview duration was approximately twenty minutes. The interviews supplement the electronic survey questionnaire and provide a deeper level of understanding for adoption and usage of SAP BI.
- Daily analytics login statistics for management were used to establish the percentage of managers using SAP BI. This logon information was obtained via SAP Authorisations. A count of daily logons by management was stored and collated for further analysis.

#### **3.6.1 Research Instrument**

Research data collection can be in the form of a questionnaire or interviews. A questionnaire is suitable for collecting data from a large sample. Interviews are more appropriate where data is collected from few respondents and addresses the qualitative components of a study. However, where the sample is large a questionnaire is best suited as it saves time. In this study, a blended approach

involving interviews and an electronic survey questionnaire was used in order to address the qualitative and quantitative elements of the study.

### 3.6.1.1 Design of the Electronic Survey Questionnaire

The electronic survey questionnaire was designed to respond to the study objectives. The electronic survey questions were directly informed by the underpinning theoretical framework and are representative of the themes in Table 3-2. The questions are focused and link to the research questions and related aims and objectives. It was created in SharePoint and sent electronically to 524 level 4 managers. Likert-type questions were used to provide an opportunity for various questions being asked, with the main purpose of addressing the research objectives and using the responses for statistical analysis. The theoretical framework directly informed the design of the questions, which consisted of the following sections as shown in Table 3-2:

**Table 3-2: Design of the electronic survey questionnaire**

<b>Themes</b>	<b>Questions sections</b>
1. Individual characteristics	<ul style="list-style-type: none"> <li>• Readiness for change</li> </ul>
2. Business intelligence systems quality characteristics	<ul style="list-style-type: none"> <li>• Information quality</li> <li>• System quality</li> <li>• Accessibility</li> <li>• User interface</li> </ul>
3. Organisational factors	<ul style="list-style-type: none"> <li>• Focus on the customer</li> <li>• Management support</li> <li>• User participation in implementation</li> <li>• Iterative development approach</li> <li>• User training</li> <li>• Organisational culture</li> <li>• Information culture</li> <li>• Change management</li> </ul>
4. Macro-environment factors	<ul style="list-style-type: none"> <li>• Business sector</li> <li>• Competitiveness of the environment</li> </ul>
5. Behavioural beliefs and attitudes	<ul style="list-style-type: none"> <li>• Relative advantage</li> <li>• Job relevance</li> </ul>
6. Effort perception	<ul style="list-style-type: none"> <li>• Ease of use</li> </ul>
7. Social influence	<ul style="list-style-type: none"> <li>• Visibility</li> <li>• Image</li> </ul>
8. Facilitation conditions	<ul style="list-style-type: none"> <li>• Technical support</li> </ul>
9. Other	<ul style="list-style-type: none"> <li>• Performance management</li> </ul>

A Microsoft SharePoint site was used as the tool for administering the electronic survey questionnaire to management. According to Perran. A, Perran.S, Mason and Rogers (2013), "SharePoint provides a great tool for conducting surveys via the survey list app and this app can be customised to deliver dynamic surveys to an organisation. All data can be viewed in a graphical format or exported to a



spreadsheet.” This method is cost effective and free of researcher bias. Each manager received an email with a link to the SharePoint site in which they completed the questions and submitted them online. Within SharePoint one is able to manage permissions of access enabling privacy for responses and limiting viewing access with the exception of the researcher, who has full view access.

### **3.6.1.2 Design of the Interview Guide**

The interview questions were directly informed by the underpinning theoretical framework and are representative of the themes in Table 3-2. The questions are focused and link to the research questions and related aims and objectives.

The interview process had semi-structured and follow-up questions, creating a clear link to the research questions, while the follow-up component gave room to query any issues raised by the participant. The researcher used an audio recording device, which proved useful for transcribing as the verbal discussions were captured.

## **3.7 Unit of Analysis**

The researcher will determine the following:

- The unit of analysis for this research was level 4 managers' usage of SAP BI over the period July 2012 to June 2016.

## **3.8 Data Analysis**

Two levels of analysis were employed and described in sections 3.8.1 and 3.8.2.

### **3.8.1 Qualitative Analysis**

Qualitative analysis methods involve the reduction, organisation, interpretation and substantiation of data. The main purpose is to identify themes and patterns embedded in the text. The researcher used thematic analysis, with these themes derived from the theoretical framework of Grubljesic and Jaklic (2015). The thematic review focussed on different schools of thought and group the literature into differing themes. The following themes were explored: individual characteristics, systems quality, organisational factors, macro-environment factors, behavioural beliefs and attitudes, effort perceptions, social influence, facilitating conditions and other. The

researcher further explored the areas within these themes and identified the influences on management usage of analytics.

The data collected from the interviews and electronic survey questionnaires formed a basis for information needed in the analysis and assisted in answering the research questions, namely what are the specific reasons that influence management analytics usage.

### **3.8.2 Quantitative Analysis**

The researcher drew conclusions from the data sets and determined the statistical significance of the collected data sets, which contain daily management logon statistics for analytics. The findings from the data sets increase the validity and reliability of the study and complement the qualitative outcomes.

### **3.9 Elimination of Bias**

The importance of the research was introduced in the body of the email to the respondents. The purpose of this was to ensure that the respondents understood that providing accurate information would contribute towards the objectives of the research. The researcher had no direct communication with respondents as the questionnaires were sent out using SharePoint electronically. The Likert scale questions were used in the study to obtain managers perceptions of SAP BI. This assisted in managers selecting the most appropriate responses.

### **3.10 Ethical Considerations**

Business Intelligence is a strategic initiative and enhances competitive advantage. As such, it is necessary to keep the identity of the individuals and organisation participating in the study confidential.

In the light of this, the organisation where the research was conducted is not named. Information obtained through this study remains strictly confidential. Confidentiality was maintained by means of anonymous inputs. No names were used in the statistical data collection.

Participants were informed of the purpose of the research and their consent sought before commencement of the data collection process. They were assured of confidentiality during the process. Codes were used to identify participants and the

directorates of the organisation. If any participant felt uncomfortable they could withdraw from the data collection process.

### **3.11 Research Contribution**

The organisation will be informed of the specific factors that are impacting management usage of analytics and will be able to apply the recommendations to encourage and improve usage, with the ultimate goal of improving efficiency and service delivery. This should increase analytics usage and, in turn, improve organisational performance and internal process efficiency. In addition, the potential increase in usage will result in a return on investment of the overall analytics solution.

This study contributes towards the existing body of knowledge in that it provides insight into specific reasons that inhibit management usage of business intelligence and how this impacts management decision making.

### **3.12 Limitations**

A limitation of this study is that it examines a cross-section of the respondent's perceptions about determinants influencing analytics adoption and usage. The results might be biased by the limited number of respondents as it would be useful to include a larger number of respondents for the results to be more representative of the whole population of analytics users within the organisation.

### **3.13 Summary**

In this Chapter, the researcher examined the approach to the case study in order to unpack the reasons for the low usage of analytics for level 4 managers. A mixed methods approach was adopted for the case study. An electronic survey questionnaire and interviews were chosen as instruments for data collection. The next Chapter delves into statistical findings and focusses on descriptive and factor analysis.

## CHAPTER FOUR: STATISTICAL DATA PRESENTATION

### 4.1 Introduction

In the previous Chapter, the researcher examined the approach to the case study in order to unpack the reasons for the low usage of analytics for level 4 managers. A mixed methods approach was adopted for the case study. An electronic survey questionnaire and interviews were chosen as instruments for data collection. In this Chapter, the statistical survey data presentation is divided into two sections, descriptive analysis and factor analysis. The researcher will examine and unpack the statistical data findings based on the feedback from the electronic survey questionnaires in relation to the underpinning theoretical framework. The data presentation will address the factors that affect the use of analytics for managers, namely: individual characteristics, business intelligence system quality, organisational factors, macro-environment factors, behavioural beliefs and attitudes, effort perception, social influence, facilitating conditions and other.

The electronic survey questionnaire was distributed to five hundred and twenty four level 4 managers, of which two hundred and eleven managers responded to the electronic survey questionnaire. Eight level 4 managers were interviewed across the directorates. The interviews complemented the electronic survey questionnaires and provided a deeper understanding of the reason for SAP BI usage and adoption. The results and interpretation are unpacked below.

### 4.2 Descriptive Analysis

Descriptive statistics is the term given to the analysis of data that helps describe, show or summarize data in a meaningful way, for example, patterns that might emerge from the data. Descriptive statistics do not, however, allow one to make conclusions beyond the data that has been analysed or to reach conclusions regarding any hypotheses we might have made. They are simply a way to describe our data.

Descriptive statistics allows the researcher to present the data in a meaningful way, which allows simpler interpretation of the data. There are two general types of statistics that are used to describe data:

- Measures of central tendency: these are ways of describing the central position of a frequency distribution for a group of data. We can describe this central position using a number of statistics, including the mode, median, and mean.

- Measures of spread: these are ways of summarizing a group of data by describing how spread out the scores are. To describe this spread, a number of statistics are available to us, including the range, quartiles, absolute deviation, variance and standard deviation.

Table 4-1 is aligned with the response options to the items on the questionnaire: 1 = “Strongly Agree” and 5 = “Strongly Disagree”. F2 has a mean of 2.8, which lies on the “disagree” side, whereas F1 has a mean of 3.6, which lies on the “agree” side. F4 is almost neutral.

**Table 4-1: Descriptive statistics**

<b>Descriptive Statistics</b>					
	N	Minimum	Maximum	Mean	Std. Deviation
F1	211	1.53	5.21	3.6879	.73800
F2	211	1.55	4.14	2.8890	.46433
F3	211	1.88	4.47	3.3305	.44262
F4	211	1.10	4.87	3.0397	.63388
F5	211	1.76	5.16	3.7260	.60297
F6	211	1.47	4.94	3.2847	.64613
Valid N (listwise)	211				

When using descriptive statistics it is useful to summarise the group of data using a combination of tables, graphs and statistical commentary (that is, a discussion of the results) (Laerd Statistics, 2013). The electronic survey questionnaire results are aligned to the underpinning theoretical framework and discussed in detail in sections 4.2.1 to 4.2.11. Note that questions do not necessarily run chronologically but are grouped according to the interrelatedness of the themes and sub-themes.

#### **4.2.1 Individual Characteristics**

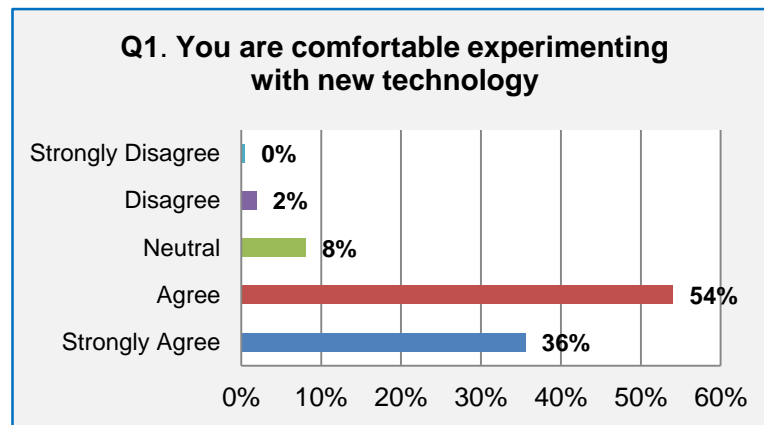
Table 4-2 is a report extracted from SAP BI outlining the average age of managers within the organisation. The average age group of managers in level 4 is forty-nine years old - this category falls into the Boomers cohort. Boomers (see Table 2-4), seek success, are ambitious and dislike authority. They do not embrace computer technology as easily as Generation X or the Millennium Generation. This group of individuals generally are resistant to technology and require a change management drive around training to ensure user adoption.

The total management compliment is nine hundred and thirteen individuals, of which eight hundred and twenty three are currently occupied.

**Table 4-2: The organisation's average age of managerial levels 0 to 4**

Managerial level	Average Age of employee	Sum of Staff	Sum of Post
0	61	1	1
1	53	9	11
2	50	54	62
3	50	235	255
4	49	524	584
<b>Grand Total</b>	<b>50</b>	<b>823</b>	<b>913</b>

Figure 4-1 represents the responses to Question 1: 90% of respondents agreed that they are comfortable with technology. This contradicts the low usage of analytics within the organisation. An average of 7% of level 4 managers are using SAP BI. This is based on the daily SAP BI logon statistics collected from July 2012 to June 2016.



**Figure 4-1: Question 1: You are comfortable experimenting with new technology**

#### 4.2.2 Business Intelligence Systems Quality

The electronic survey questions addressing system quality characteristics provided results around information and system quality, accessibility and the user interface.

##### 4.2.2.1 System quality characteristics

Figure 4-2 represents the feedback from Question 2, 63% of respondents agreed that the information quality is trustworthy and, therefore, usage of the tool should be high due to the confidence in the data quality. However, an average of 7% of level 4 managers are using SAP BI, which is low in comparison to the confidence levels.

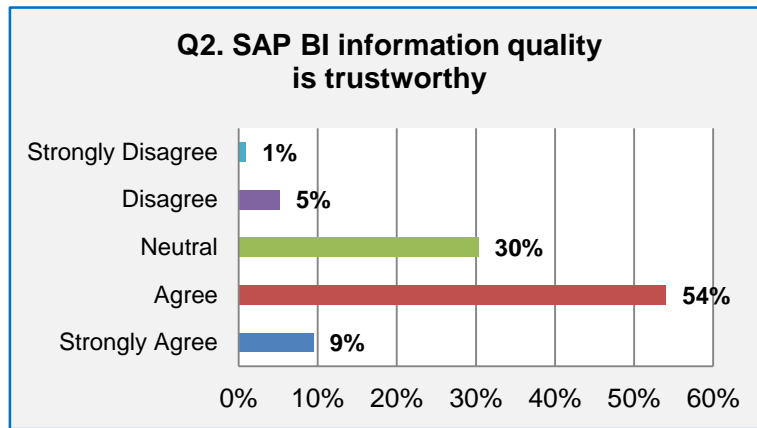


Figure 4-2: Question 2: SAP BI information quality is trustworthy

#### 4.2.2.2 Access to SAP BI

Based on the electronic survey questionnaire in response to Question 4, 57% of managers confirmed that obtaining SAP BI access was straight-forward, whilst 43% had an issue obtaining the SAP BI access, as shown in Figure 4-3. Unclear instructions on obtaining SAP BI access may result in managers becoming frustrated with the process and not following up on their SAP BI access.

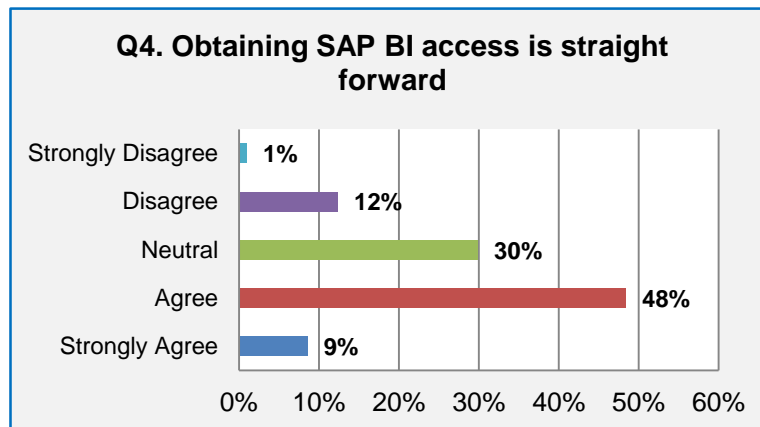
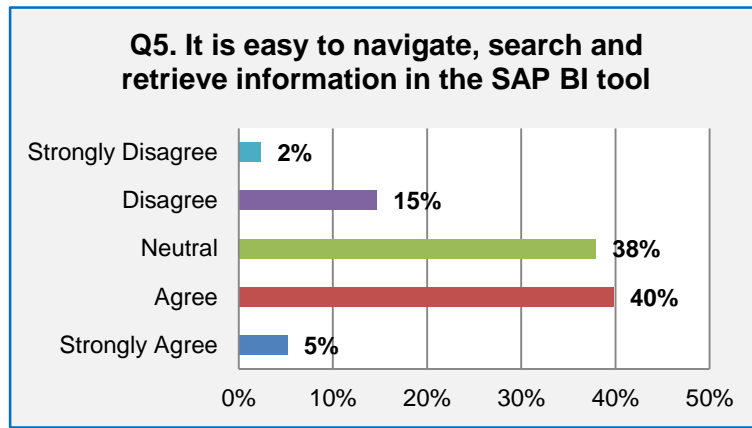


Figure 4-3: Question 4: Obtaining SAP BI access is straight forward

#### 4.2.2.3 User Interface

With respect to Question 5, 45% of managers confirmed that the SAP BI interface is user-friendly, easy to use and to learn. The remaining 55% do not find the tool easy to navigate which could possibly contribute towards low SAP BI usage. This is illustrated in Figure 4-4.

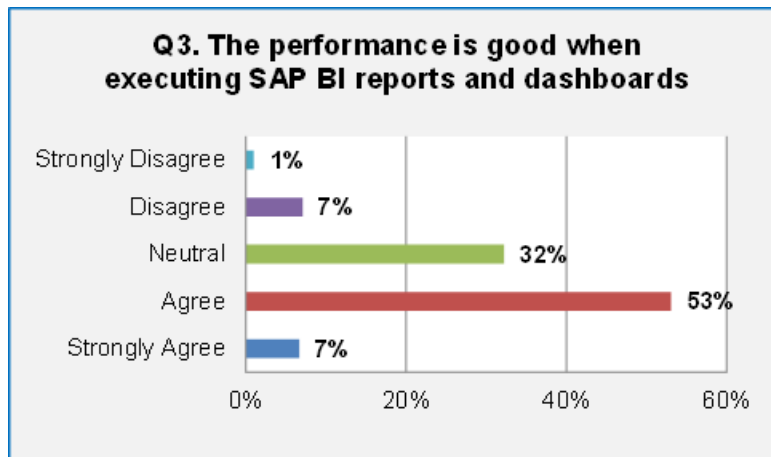


**Figure 4-4: Question 5: The SAP BI interface is user-friendly, easy to use and to learn**

**4.2.2.4 Execution response times of reports**

Within the organisation under study, report response times were slow and cumbersome when the tool was first introduced. The Information Technology (IT) Department purchased SAP Business Intelligence Accelerator (SAP BI-A) in 2011 to address poor performance of the SAP BI reports. This resulted in improved response times for the reports. The IT Department needs to ensure that the growing volumes of data are catered for by ensuring that the memory requirements of SAP BI-A are adequately addressed for future data volume growth.

In response to Question 3, 60% of managers confirmed that the performance is good when executing SAP BI reports and dashboards (see Figure 4-5). The remaining 40% were not satisfied with performance resulting in lack of use of the tool. The IT Department did not enhance the performance of all reports, only the most frequently used reports. As a result performance was slow on some of the reports. The IT Department needs to enhance performance on frequently used reports regularly, to ensure higher usage of the tool.



**Figure 4-5: Question 3: The performance is good when executing SAP BI reports and dashboards**



### 4.2.3 Organisational Factors

#### 4.2.3.1 Focus on the customer

The organisation studied is a public sector concern and focusses on people, not profit. It provides services and service level agreements are taken into account. Profit is not the main driver. Only where customer satisfaction is crucial, the use of analytics is more embedded into the organisation. The organisation is not required to predict consumer demand and needs and, as a result, the usage of analytics is not a driving factor.

Regarding Question 6, 78% of managers agreed that SAP BI can improve service delivery (seen in Figure 4-6). This contradicts the low usage (average of 7%) of the SAP BI tool if it could increase service delivery.

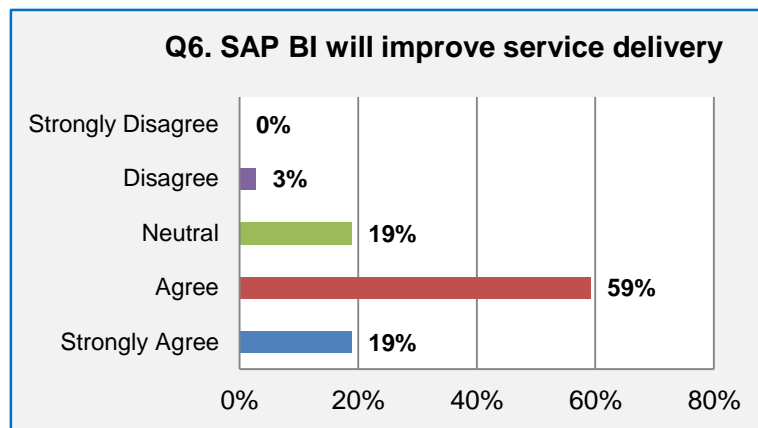


Figure 4-6: Question 6: SAP BI will improve service delivery

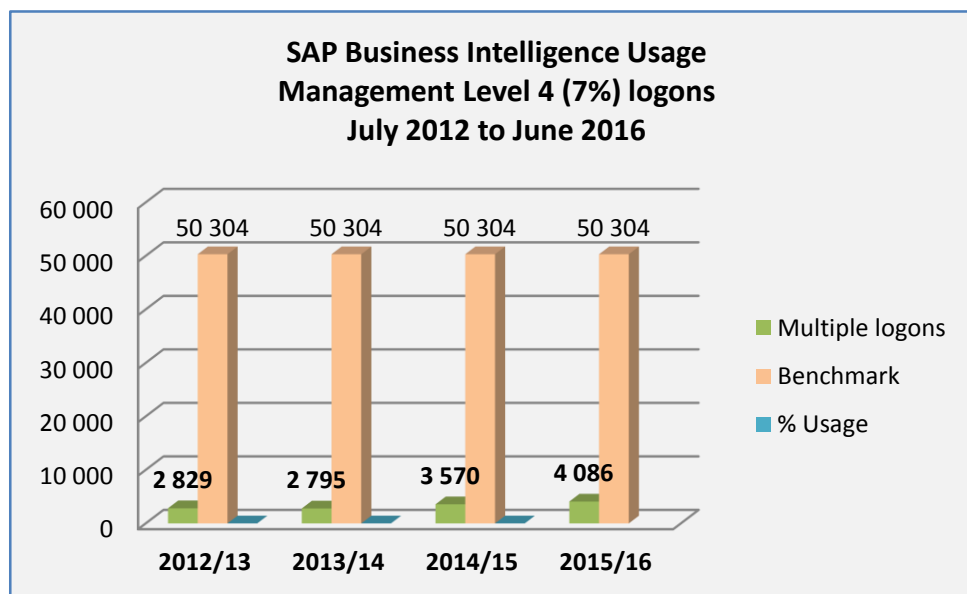
#### 4.2.3.2 Management support

Daily statistics of SAP BI logon details were collected from July 2012 to June 2016. The managerial compliment is currently 913 positions, of which 823 are occupied. The total managerial compliment has not changed significantly over this period. The overall managerial usage of the analytical tool is on average 7% over the four-year period. This is based on a benchmark of monthly number of logins per occupational category into the SAP BI system versus the actual logins of the managerial levels. Refer to Figure 4-3.

**Table 4-3: Organisation's CIO benchmark of logins into SAP BI by managerial levels 0-4**

Benchmark logins into SAP BI			
Managerial level	Number of employees	Benchmark logins per month	Total benchmark loggings
0	1	x0	0
1	9	x0	0
2	54	x4	216
3	235	x5	1175
4	524	x8	4192
Total	823		5583

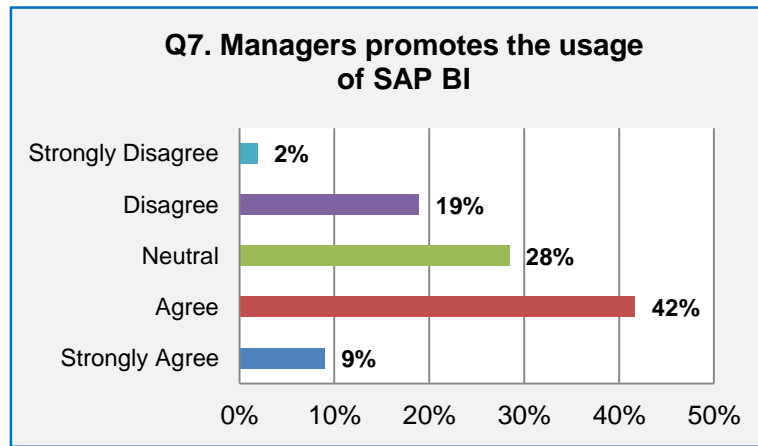
Figure 4-7 is a representation of the SAP BI usage by level 4 managers versus the recommended benchmark provided by the CIO.



**Figure 4-7: The organisation's benchmark of analytics logins versus actual analytics logins by level 4 management**

Figure 4-7 raises questions about reasons for such low usage bearing in mind that information provides an organisation with a competitive edge.

As shown in Figure 4-8 regarding Question 7, 51% of managers promote SAP BI, which contradicts the low usage of SAP BI.

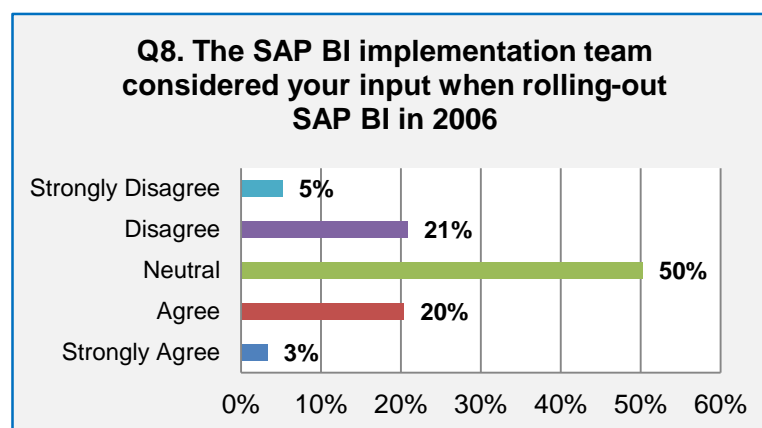


**Figure 4-8: Question 7: Management promotes the usage of SAP BI**

#### **4.2.3.3 User participation in the implementation**

Within the organisation under study, key stakeholders were engaged with during the implementation of SAP BI to establish the key reporting requirements. Once these areas were identified, development of reports commenced. This formed part of the first phase of the roll-out of SAP BI. Phase one reports covered capital and operational reports, service delivery monitoring reports, debt management and payroll/staff cost reports.

Responses to Question 8 indicate 23% of the managers agreed that their input was considered in the roll-out of SAP BI, as shown in Figure 4-9. If managers are included in the development and rollout of SAP BI, usage is expected to increase due to buy-in of the tool.



**Figure 4-9: Question 8: The SAP BI implementation team considered your input when rolling-out SAP BI in 2006**

#### 4.2.3.4 Iterative development approach

Within the organisation under study, report creation involves a two-pronged approach. Business and IT need to work closely together in establishing business requirements. Business does not necessarily know what is required and this results in scope creep and iterative development approaches to reports and can lead to frustration for users as a result of long turnaround times for report development.

Users indicated that long development times were experienced as a result of the model of development that is being used. Technical staff are reliant on input from functional business analysts, who are involved with project and support work and capacity is an issue, impacting negatively on the SAP BI development timelines.

Responses to Question 9 indicate that 31% of the managers requested a SAP BI development (report or dashboard) for their specific business needs, as Figure 4-10 shows.

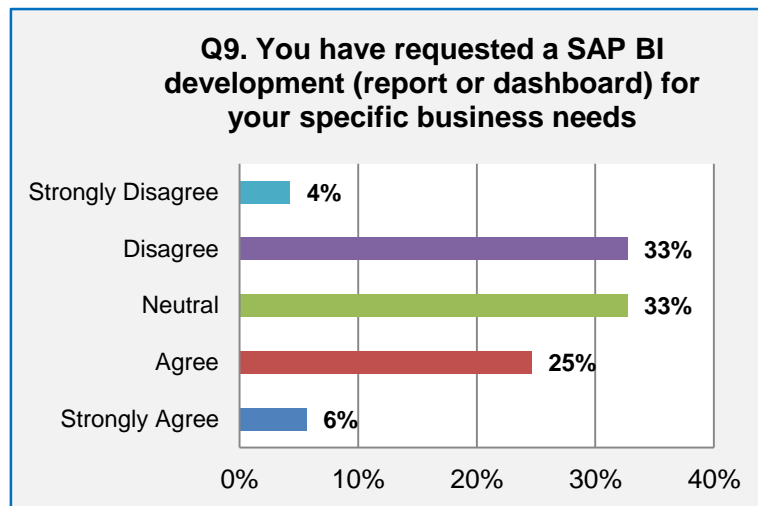
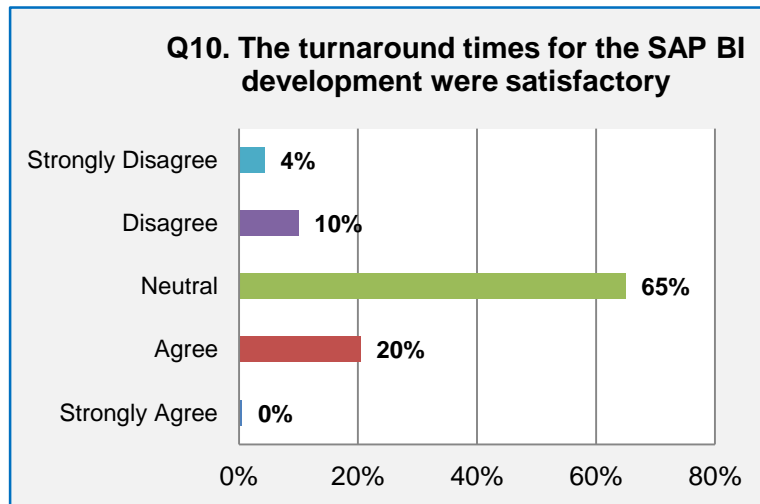


Figure 4-10: Question 9: You have requested a SAP BI development (report or dashboard) for your specific business needs

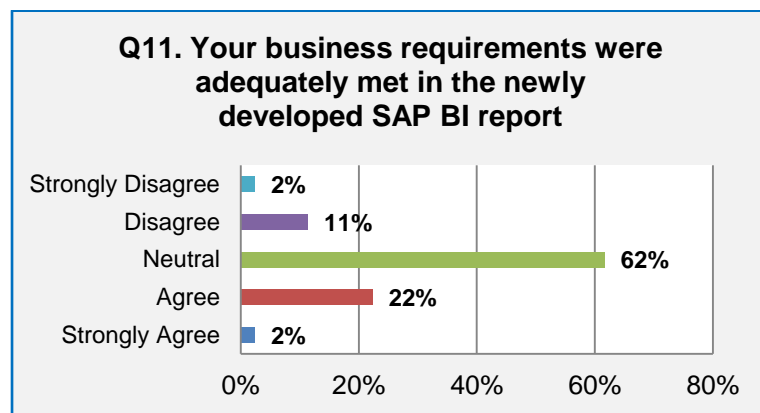
With respect to Question 10, 20% of the managers confirmed that the turnaround times for the SAP BI developments were satisfactory, while 14% disagreed and were not satisfied with the SAP BI report delivery timelines. This situation is shown in Figure 4-11.



**Figure 4-11: Question 10: The turnaround times for the SAP BI development were satisfactory**

#### **4.2.3.5 Business requirements**

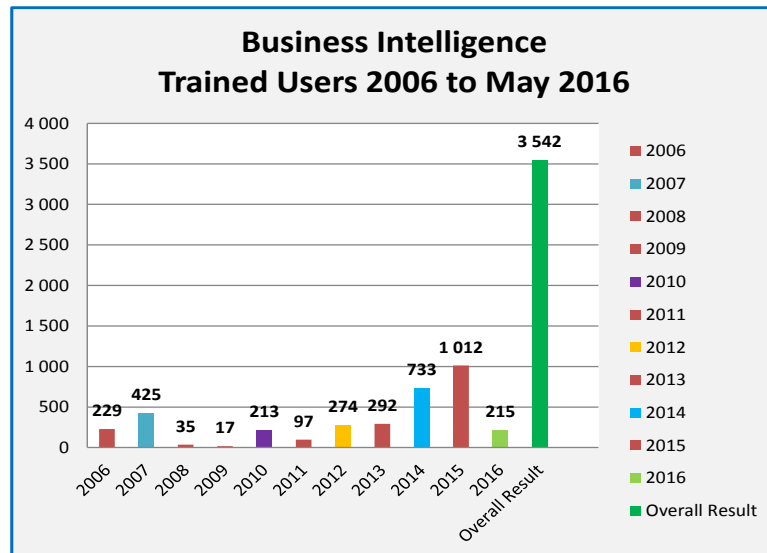
In Figure 4-12, it is clear that regarding Question 11, 24% of the managers' business requirements were adequately met in the new SAP BI developed report. The results highlight that there is room for improvement around detailed specification requirements for the reports.



**Figure 4-12: Question 11: Your business requirements were adequately met in the newly developed SAP BI reports**

#### **4.2.3.6 User training**

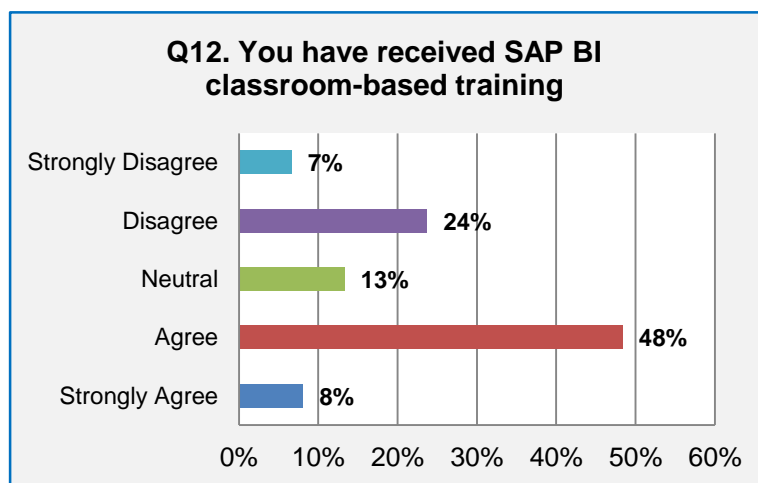
Within the organisation under study, analytics training is available for employees in the form of classroom-based and e-learning training. The number of users trained from 2006 to 2016 is 3 542 and is graphically displayed in Figure 4-13.



**Figure 4-13: The organisation’s SAP BI training totals - all users: 2006 to 2016**

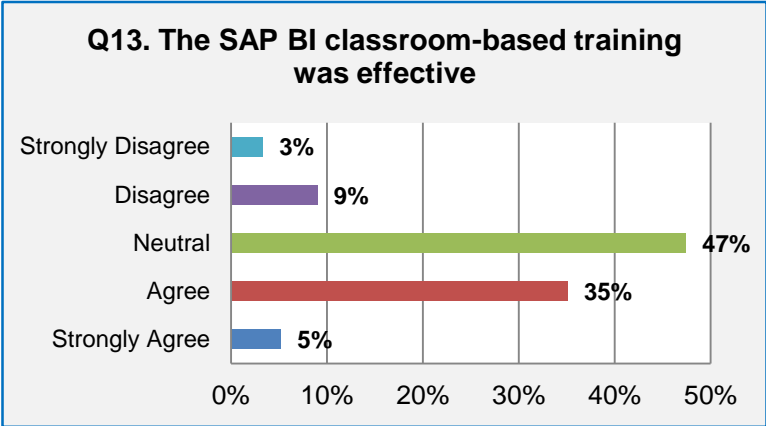
Managerial levels 0 to 4 were given access to SAP BI when the tool was launched in 2006 without any formal training. The training statistics in Figure 4-13 may be misleading from the view that users can be marked “trained”, without formal training, but have received peer-to-peer training from their colleagues. This may well impact the quality of “training” received, and negatively impact on SAP BI usage.

As Figure 4-14 shows with regard to Question 12, 56% of the managers received SAP BI classroom-based training. 31% have not received formal classroom-based training, which may negatively impact the usage of SAP BI. With the low SAP BI usage one can conclude that the training has not addressed all the managers’ needs. This has been confirmed in the interviews as well.



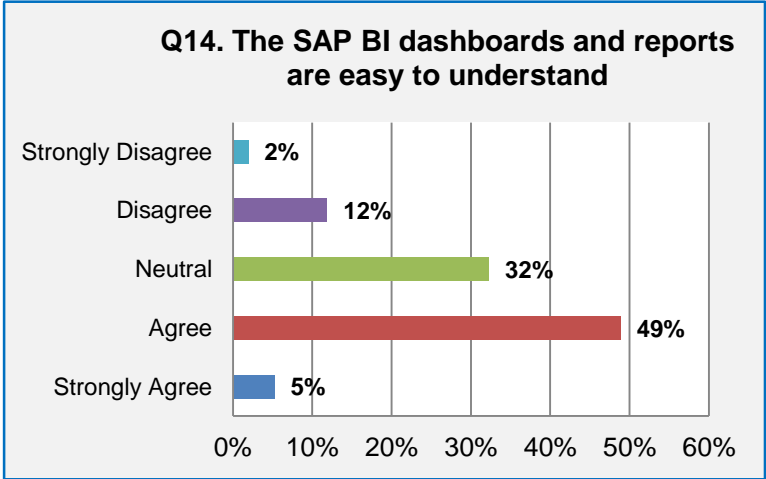
**Figure 4-14: Question 12: You have received SAP BI classroom-based training**

Responses to Question 13 of the questionnaire, show 12% of the managers surveyed mentioned that the SAP BI training was not effective, whilst 47% took a neutral stance, which will result in low SAP BI usage. This is reflected in Figure 4-15.



**Figure 4-15: Question 13: The SAP BI classroom-based training was effective**

Based on the electronic survey questionnaire, Question 14, 54% of managers confirmed that the SAP BI dashboards and reports are easy to understand, whilst the remainder of the users struggled with interpreting the dashboards. This will result in low SAP BI usage. Figure 4-16 reflects all responses.



**Figure 4-16: Question 14: The SAP BI dashboards and reports are easy to understand**

According to responses to Question 15, 57% of managers confirmed that the SAP BI E-Learning training is easy to find on the portal (see Figure 4-17). This should empower users by refreshing their SAP BI skills and increase usage of the tool. Awareness communication about where to find the SAP BI E-Learning training

needs to be sent to all managerial staff who have stated that finding the SAP BI E-Learning training is not easy.

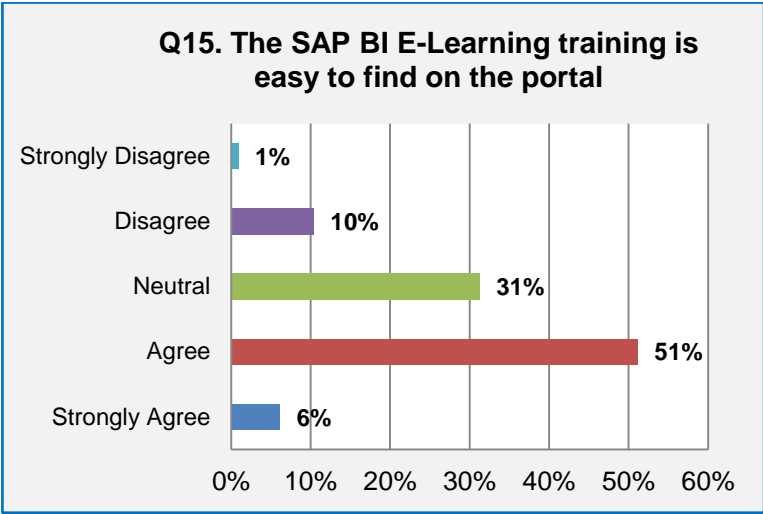


Figure 4-17: Question 15: The SAP BI E-Learning training is easy to find on the portal

Based on the electronic survey questionnaire, Question 16, 41% of managers found the E-learning training effective, while 54% stated a neutral stance, which could possibly imply that they were indifferent to the training or did not use the training material and therefore, could not make a judgement on the training material. Respondents' views were shown in Figure 4-18.

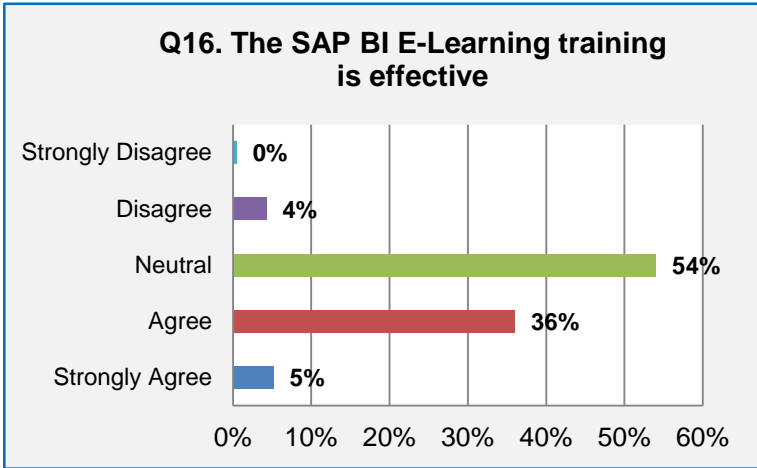


Figure 4-18: Question 16: The SAP BI E-Learning training is effective



### 4.2.3.7 Organisational Culture

#### 4.2.3.7.1 Information Culture

Responses to Question 17, indicate that 77% of managers thought the organisation promotes information readiness as shown in Figure 4-19. This contradicts the low usage of SAP BI.

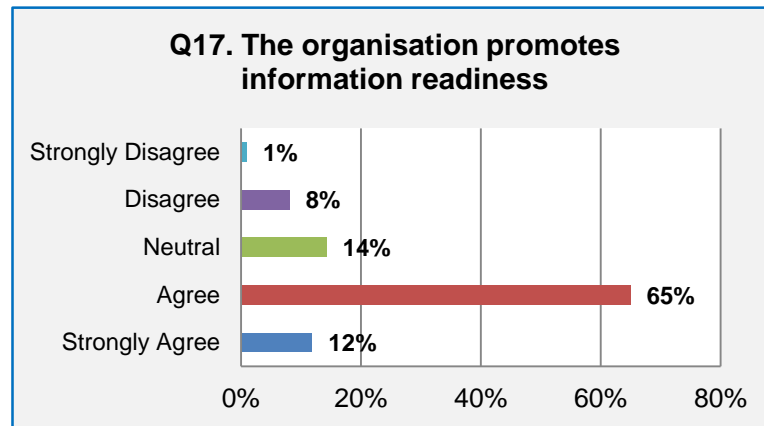


Figure 4-19: Question 17: The organisation promotes information readiness

#### 4.2.3.7.2 Information integrity

Within the organisation under study, information integrity is of high importance. The SAP BI's data source system is the SAP ERP system. Reporting may be skewed if data is of poor quality. Therefore, the reporting impacts are huge if data quality is poor. Accurate information is more useful and more valuable.

SAP BI data is extracted from the SAP ECC6 transactional layer and loaded in a nightly batch. If the batch fails, for any reason, the data is not updated and results in users not trusting the reports.

Data quality is of utmost importance for the users of analytics, as data is used in making strategic decisions. Therefore, monitoring of the batch to ensure that all process chains have completed successfully is of critical importance. Automatic monitoring and alerts need to be active. If a process chain fails, a SMS alert should be sent to the individual on stand-by in order to rectify the failed process chain.

From responses to Question 2, 63% of managers trust the SAP BI information quality. This contradicts the low usage of SAP BI. Figure 4-20 reflects detailed responses.

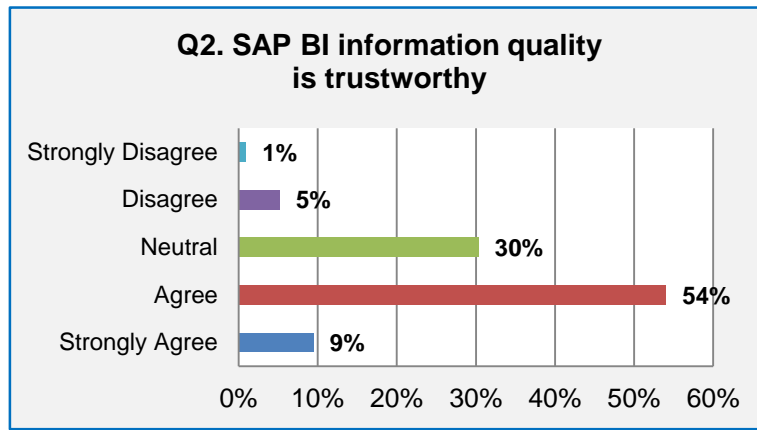


Figure 4-20: Question 2: SAP BI information quality is trustworthy

#### 4.2.3.7.3 Information transparency

The CIO supports and promotes transparency. As a result, the SAP BI portal is open for all users who have a reporting role. The only restricted areas are: performance management, salaries and occupational health and safety.

Responses to Question 18 show 61% of managers confirmed that information culture is promoted within the directorates. This, however, contradicts the low usage of SAP BI. Figure 4-21 reflects all responses.

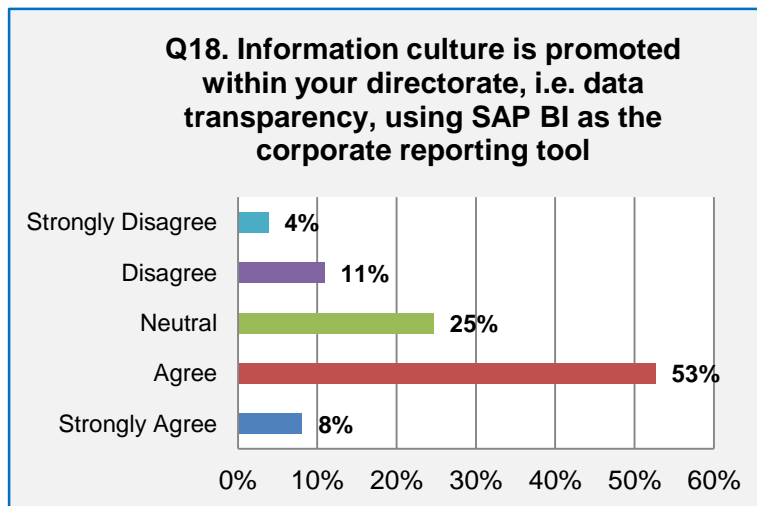


Figure 4-21: Question 18: Information culture is promoted within your directorate, i.e. data transparency, using SAP BI as the corporate reporting tool

According to responses to Question 21, 45% of managers agreed that SAP BI provides a competitive edge for their specific needs, which contradicts the low usage of SAP BI.

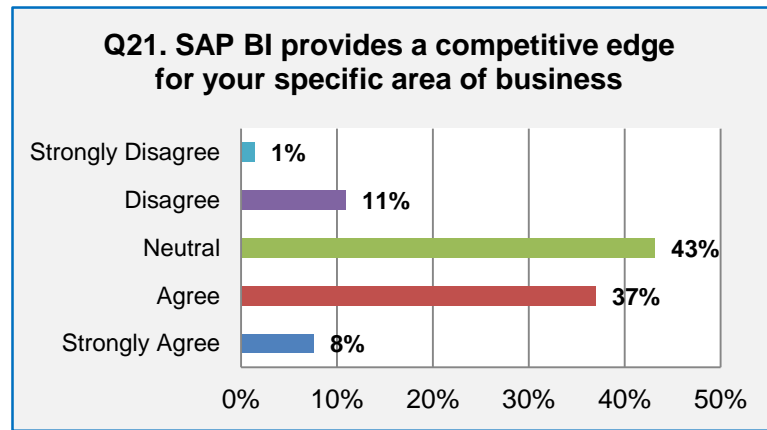


Figure 4-22: Question 21: SAP BI provides a competitive edge for your specific area of business

#### 4.2.3.8 Change Management

##### 4.2.3.8.1 Marketing and awareness of new reports

SAP BI reporting was launched to managerial levels 0-4 within the organisation in 2006. A once-off exercise to grant SAP BI access was given to all level 0 to 4 managers without any formal training. Thereafter, managers needed to apply for access and this entailed training before access was granted. The training is generic in nature and focusses on navigation within the tool. Training is mandatory for users in order to receive SAP BI access.

In order to promote SAP BI within the organisation, the SAP BI team introduced quarterly newsletters to create awareness of the new reports.

Based on the electronic survey questionnaire, Question 19, 51% of managers are said to actively promote and support SAP BI. Based on this support, one would think that SAP BI usage would be higher than the recorded 7% average. Detailed responses are shown in Figure 4-23.

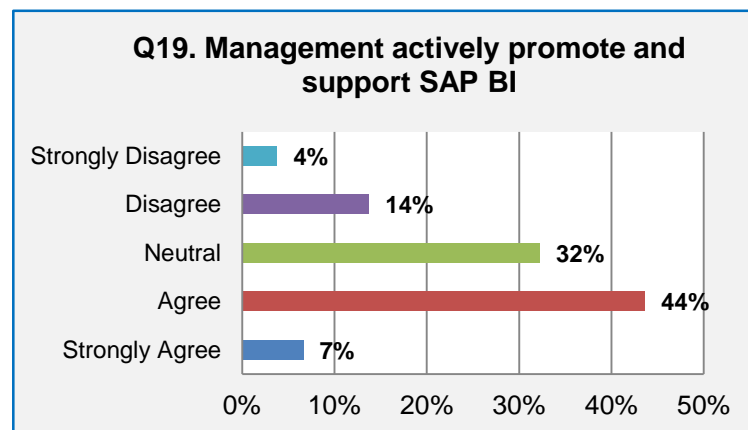


Figure 4-23: Question 19: Management actively promote and support SAP BI

According to responses to Question 13, 40% of managers agreed that the SAP BI training was effective as shown in Figure 4-24. The remaining 60%, either found it ineffective or had peer-to-peer training, which supports the low usage of the tool.

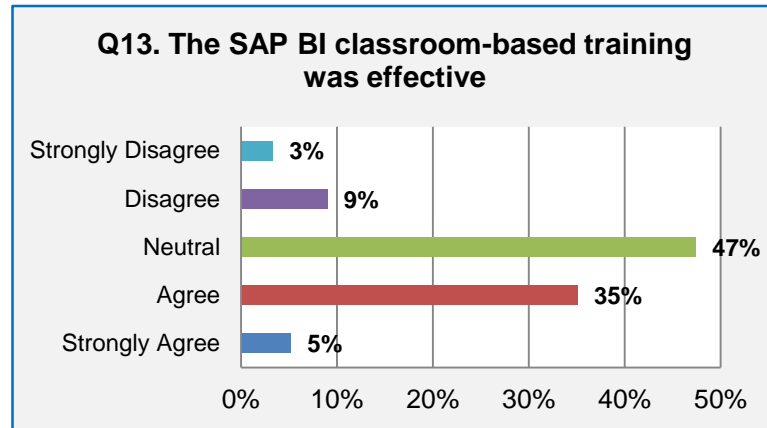


Figure 4-24: Question 13: The SAP BI classroom-based training was effective

#### 4.2.4 Macro-Environment Factors

##### 4.2.4.1 Business sector / competitiveness of the environment

The organisation studied is a public sector concern and people focused. As a result, analytics is not deemed critical by some managers for the success of its operations.

Based on Question 20 of the electronic survey questionnaire, 57% of managers agreed that SAP BI benefits the public sector as shown in Figure 4-25. This contradicts the low SAP BI usage.

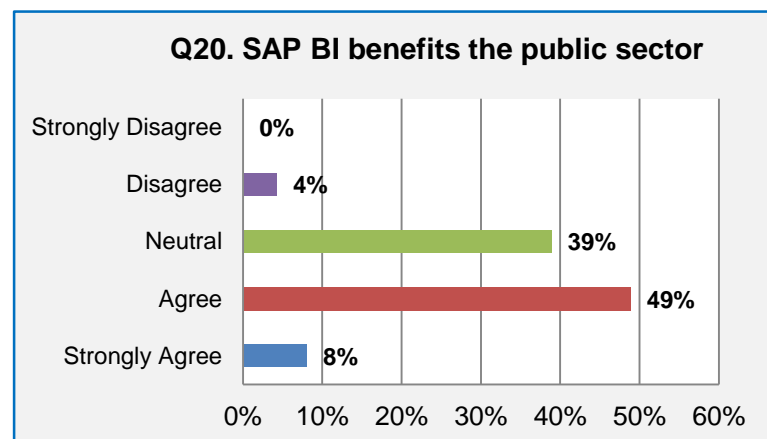


Figure 4-25: Question 20: SAP BI benefits the public sector

#### 4.2.5 Behavioural Beliefs and Attitudes

##### 4.2.6 Relative advantage

Responses to Question 21 show 45% of managers agreed that SAP BI provides a competitive edge for their specific needs. This, however, contradicts the low usage of SAP BI. Figure 4-26 captures respondents' views.

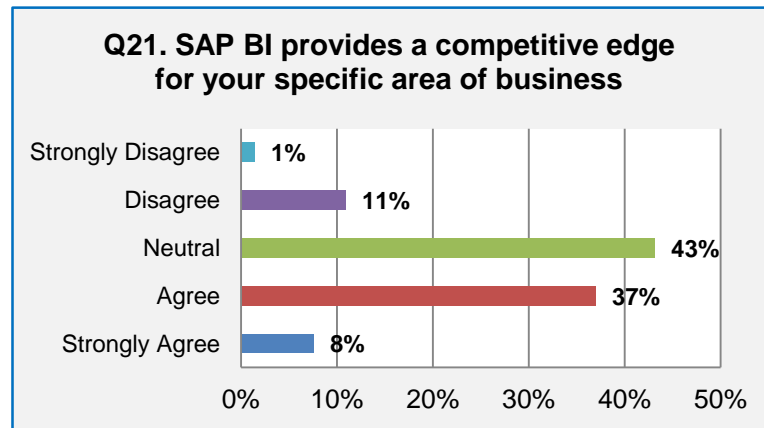
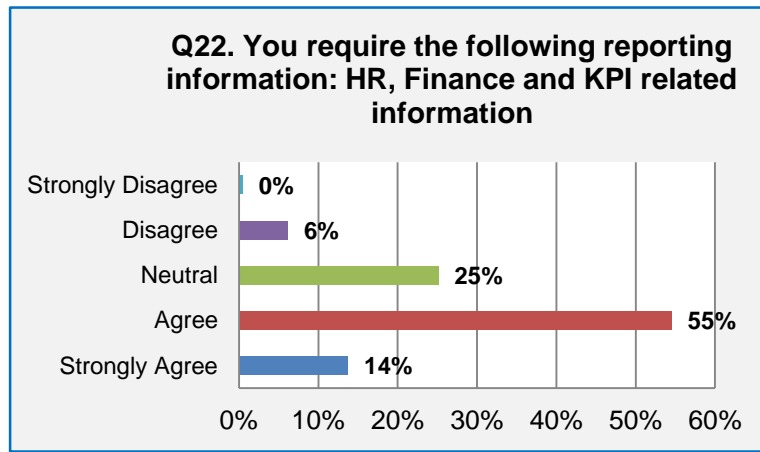


Figure 4-26: Question 21: SAP BI provides a competitive edge for your specific area of business

##### 4.2.7 Job relevance

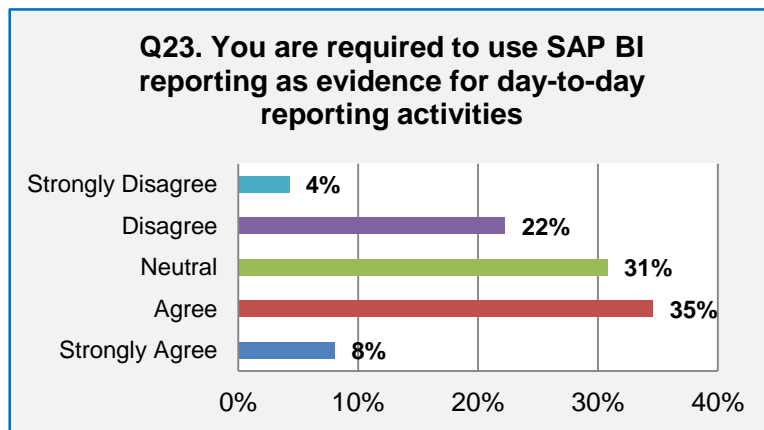
Within the organisation under study, managers should be utilising corporate reporting capabilities to assist in strategic decision making. Managers who are process owners should be utilising analytics as they are required to report on a quarterly basis to the executive management team. What has been established is that a percentage of managers task their personal assistants or clerks with drawing reports on their behalf. This has impacted negatively on management analytics usage statistics.

Based on the electronic survey questionnaire, Question 22, 69% of managers reported that they needed to report on HR, Finance and KPI related information (Figure 4-27). This indicates that managers should use SAP BI if their role requires it.



**Figure 4-27: Question 22: You require the following reporting information: HR, Finance and KPI related information**

Regarding Question 23 of the electronic survey questionnaire, 57% of managers reported that they do not need to use SAP BI as evidence for day-to-day reporting activities. This confirms the low usage of SAP BI. Detailed information is shown in Figure 4-28.



**Figure 4-28: Question 23: You are required to use SAP BI reporting as evidence for day-to-day reporting activities**

## 4.2.8 Effort Perception

### 4.2.8.1 Ease of use

Based on the electronic survey questionnaire, Question 5, 45% of managers reported that the SAP BI interface is user-friendly, easy to use and to learn. However, 55% indicated a different view of the tool. This confirms the low usage of the SAP BI tool. Details of responses are shown in Figure 4-29.

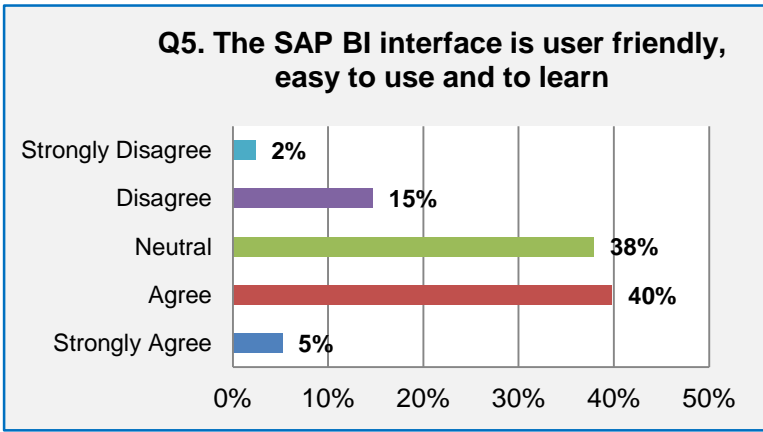


Figure 4-29: Question 5: The SAP BI interface is user-friendly, easy to use and to learn

**4.2.8.1.1 SAP BI adoption**

SAP BI usage and adoption is monitored through SAP Authorisation. When a user logs on the SAP portal and executes the Corporate Reporting Tab it records the users logon details. These details have been captured and recorded daily since January 2011.

Figure 4-30 depicts analytics usage from 2011 to 2016. This includes managers and all other staff with access to SAP BI.

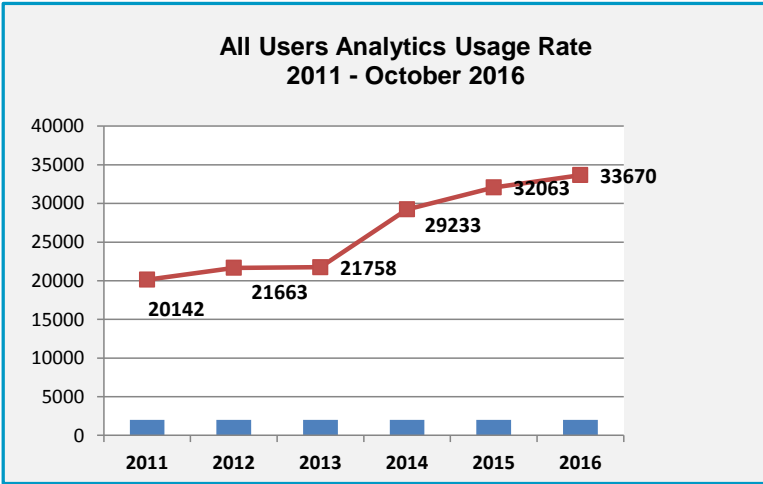


Figure 4-30: The organisation's total analytics usage from 2011 to October 2016

## 4.2.9 Social Influence

### 4.2.9.1 Visibility

### 4.2.9.2 Image

Corporate Performance Management was implemented in the organisation in 2008 to extend the footprint of SAP BI. The tool that is used within the organisation for corporate performance monitoring and reporting is SAP Strategy Management, which is based on the balanced scorecard methodology.

A number of key performance indicators (KPIs) values are obtained from SAP BI. For example, employment equity indicator, capital expenditure, operating expenditure, absenteeism, bursary opportunities, percentage spend on repairs and maintenance, number of apprentices, vacancy rates, and occupational health and safety incidents reported. These values are captured into SAP Strategy Management and reported to the Executive Team on a quarterly basis. The captured figures are required to be supported with evidence. This evidence is extracted from the SAP BI reports and attached as a PDF file and uploaded into the Corporate Performance Management tool to the relevant KPI. This has increased the usage of SAP BI. However, the capturers extract SAP BI information on behalf of their managers. If the managers started using SAP BI it would result in an improved, enabled management force, increasing core competencies and creating a sustained competitive advantage for the organisation.

Based on Question 7 of the electronic survey questionnaire, 51% of managers confirmed that they promote SAP BI usage, while 39% do not promote the usage of SAP BI, which is evident in the low usage of SAP BI. All relevant responses are shown in Figure 4-31.

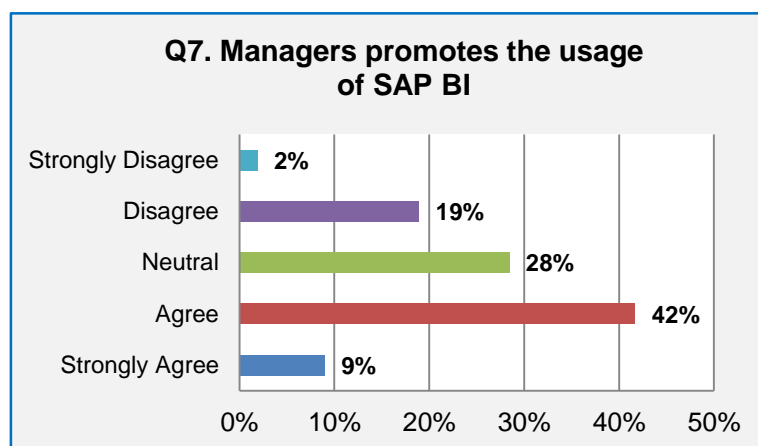


Figure 4-31: Question 7: Managers promote the usage of SAP BI



#### 4.2.10 Facilitating Conditions

Based on the electronic survey questionnaire, Question 24, 43% of managers confirmed that the technical support for SAP BI issues were good. Efficient technical support will assist managers with the transition of low usage to frequent SAP BI usage.

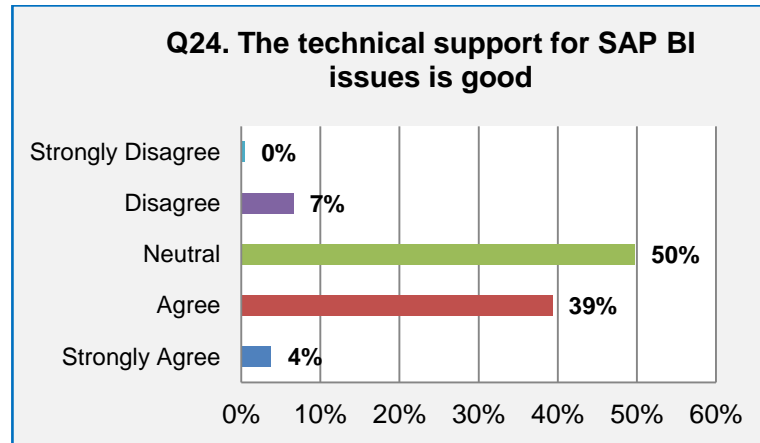


Figure 4-32: Question 24: The technical support for SAP BI issues is good

#### 4.2.11 Other

Based on Question 25 of the electronic survey questionnaire, 62% of managers agreed that analytics usage would improve if placed on an individual's performance management scorecard. What gets managed gets done holds true for most organisations. Managers will make an effort to use the SAP BI tool if they are being measured and monitored on usage with the objective of increasing overall performance for the organisation. Figure 4-33 reflects respondents' views.

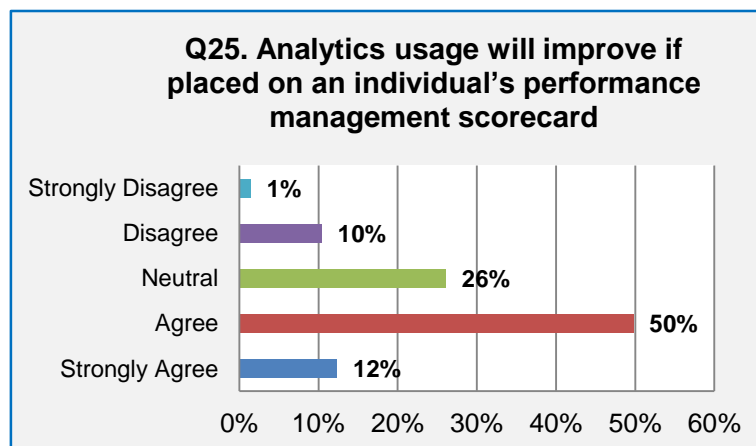


Figure 4-33: Question 25: Analytics usage will improve if placed on an individual's performance management scorecard

### 4.3 Factor analysis

According to Pallant, (2007:179), factor analysis reduces a large set of variables to a smaller use of factors or components by identifying the inter-correlations in the set of variables. Factor analysis was used to determine if there are underlying factors or themes in the data. Six factors were extracted by means of regression.

Factors are similar to “themes” in qualitative data analysis. In factor analysis, all correlations between all the different items (1 to 25) are calculated and those that are highly correlated with each other are clustered together in a factor.

Six factors were extracted by means of regression and relate to the theoretical framework. These factors have been used for the thematic analysis as well.

The six factors identified via regression were:

- F1 : Management support
- F2 : User interface
- F2 : System quality
- F4 : Iterative development approach
- F5 : Job relevance
- F6 : User training

Table 4-4 lists the questions per identified factor and the associated themes and sub-themes.

**Table 4-4: Theme and sub-themes breakdown per factor**

Factor		Questions	Theme & Sub-theme
F1 Management support	Q19	Management actively promote and support SAP BI.	Social influence → Image
	Q18	Information culture is promoted within your directorate.	Organisational factors → Information culture
	Q17	The organisation promotes information readiness.	Organisational factors → Organisational culture
	Q07	Management promotes the usage of SAP BI.	Organisational factors → Management support
F2 User interface	Q15	The SAP BI E-Learning training is easy to find on the portal.	Organisational factors → User training
	Q04	Obtaining SAP BI access is straight forward.	System quality characteristics → Accessibility
	Q05	It is easy to navigate, search and retrieve information in the SAP BI tool.	System quality characteristics → User interface
	Q16	The SAP BI E-Learning training is effective.	Organisational factors → User training
	Q14	The SAP BI dashboards and reports are easy to understand.	Organisational factors → User training

Factor		Questions	Theme & Sub-theme
F3 System quality	Q6	SAP BI will improve service delivery.	Organisational factors → Focus on the customer
	Q01	You are comfortable experimenting with new technology.	Individual characteristics → Readiness for change
	Q02	SAP BI information quality is trustworthy.	System quality characteristics → System quality
	Q20	SAP BI benefits the public sector.	Macro environment factors → Business sector
	Q03	The performance is good when executing SAP BI reports and dashboards.	System quality characteristics → System quality
	Q25	Analytics usage will improve if placed on an individual's performance management scorecard.	Other
F4 Iterative development approach	Q11	Your business requirements were adequately met in the newly developed report.	Organisational factors → Iterative development approach
	Q10	The turnaround times for the SAP BI developments were satisfactory.	Organisational factors → Iterative development approach
	Q24	The technical support for SAP BI issues is good.	Facilitating conditions
F5 Job relevance	Q23	You are required to use SAP BI reporting as evidence for day-to-day business reporting activities.	Social influence → Visibility
	Q22	You require the following reporting information to enable management decisions in HR, Finance and KPI related information.	Behavioural belief and attitudes → Job relevance
	Q09	You have requested a SAP BI (report or dashboard) to be developed for your specific business needs.	Organisational factors → Iterative development approach
	Q21	SAP BI provides your team with a competitive advantage.	Macro-environment factors → Competitiveness of the environment
F6 User training	Q13	The SAP BI classroom-based training was effective.	Organisational factors → User training
	Q12	You have received SAP BI classroom-based training.	Organisational factors → User training
	Q08	The SAP BI implementation team considered your input when rolling-out SAP BI in 2006.	Organisational factors → User participation in implementation

### 4.3.1 Cronbach's alpha

Tavakol and Dennick (2011) affirm that validity and reliability are two fundamental elements in the evaluation of a measurement instrument. Instruments can be conventional knowledge, skill or attitude tests, clinical simulations or survey questionnaires. Instruments can measure concepts, psychomotor skills or affective values. Validity is concerned with the extent to which an instrument measures what it is intended to measure. Reliability is concerned with the ability of an instrument to measure consistently. Cronbach's alpha is the most widely used with the objective to measure reliability. The Cronbach's alpha values in Table 4-5 are all above 0.7, which is deemed to be reliable.

According to Tavakol and Dennick (2011), the number of test items, item inter-relatedness and dimensionality affect the value of alpha. Acceptable values of alpha range from 0.70 to 0.95. A low value of alpha could be due to a low number of questions, poor inter-relatedness between items. A low alpha should be revised or discarded. If alpha is too high it may suggest redundancy. A maximum alpha value of 0.90 is recommended.

Table 4-5 shows the "loadings" of each of the items on the factor.

**Table 4-5: Factor analysis to determine underlying themes**

Pattern Matrix <sup>a</sup>								Cronbach's Alpha
		Factor						
		1	2	3	4	5	6	
Q19	Management actively promote and support SAP BI.	0.923						0.85
Q18	Information culture is promoted within your directorate.	0.722						
Q17	The organisation promotes information readiness.	0.684	0.323					
Q07	Management promotes the usage of SAP BI.	0.660						
Q06	SAP BI will improve service delivery.		0.766					0.832
Q01	You are comfortable experimenting with new technology.		0.608					
Q02	SAP BI information quality is trustworthy.		0.569					
Q20	SAP BI benefits the public sector.		0.542					
Q03	The performance is good when executing SAP BI reports and dashboards.		0.451					
Q25	Analytics usage will improve if placed on an individual's performance management scorecard.		0.345			0.312		
Q15	The SAP BI E-Learning training is easy to find on the portal.			0.842				0.745
Q04	Obtaining SAP BI access is straight forward.			0.744				

Pattern Matrix <sup>a</sup>								Cronbach's Alpha
		Factor						
		1	2	3	4	5	6	
Q05	It is easy to navigate, search and retrieve information in the SAP BI tool.			0.733				0.824
Q16	The SAP BI E-Learning training is effective.			0.618				
Q14	The SAP BI dashboards and reports are easy to understand.			0.443				
Q11	Your business requirements were adequately met in the newly developed reports.				0.975			0.824
Q10	The turnaround times for the SAP BI development were satisfactory.				0.816			
Q24	The technical support for SAP BI issues is good.							
Q23	You are required to use SAP BI reporting as evidence for day-to-day business reporting activities.					0.840		0.712
Q22	You require the following reporting information to enable management decisions in HR, Finance and KPI related information.					0.554		
Q09	You have requested a SAP BI (report or dashboard) to be developed for your specific business needs.					0.459		
Q21	SAP BI provides your team with a competitive advantage.					0.450		
Q13	The SAP BI classroom-based training was effective.						0.841	0.747
Q12	You have received SAP BI classroom-based training.						0.618	
Q08	The SAP BI implementation team considered your input when rolling-out SAP BI in 2006.						0.338	

Extraction Method: Maximum Likelihood.  
Rotation Method: Promax with Kaiser Normalization.

a. Rotation converged in 7 iterations.

#### 4.4 Summary

This Chapter addressed the descriptive and factor analysis of the data. The researcher unpacked the statistical data findings based on the feedback from the electronic survey questionnaires in relation to the underpinning theoretical framework. The factors or themes were extracted by means of regression and were grouped accordingly. Cronbach's alpha was used to check the reliability and validity of the questions in the electronic survey questionnaire and this proved to be in an acceptable range. The main themes emerging from the electronic survey questionnaires are: management support, system quality, user interface, iterative development approach, job relevance and user training. The next Chapter examines the qualitative data from the interviews using thematic analysis.

## **CHAPTER FIVE: THEMATIC ANALYSIS OF QUALITATIVE DATA**

### **5.1 Introduction**

The previous Chapter addressed the descriptive and factor analysis of the data. The researcher unpacked the statistical data findings based on the feedback from the electronic survey questionnaires in relation to the underpinning theoretical framework. This Chapter unpacks the qualitative data from the interviews using thematic analysis. According to Ruhode (2016), 'Thematic analysis is a method for identifying, analysing, and reporting patterns (themes) within data. A theme captures something important about the data in relation to the research question and represents some level of patterned response or meaning within the data set.' In analysing these documents, this study interrogates the data with the aim of answering the question: why is analytics usage low amongst managers?

Ruhode (2016), states that themes come both from the data (an inductive approach) and from the investigator's prior theoretical understanding of the phenomenon under study (a priori approach). In a priori approach, themes come from the characteristics of the phenomenon being studied as understood by the researcher. A researcher's values, theoretical orientations and personal experiences can be sources of themes in a priori approach (Ruhode, 2016:3). In this study, a priori approach was used.

### **5.2 Thematic Analysis of the Interview Documents**

Table 5-1 shows the identified dominant themes and their descriptions. These themes were identified in the theoretical framework and underpin the interview questions. The themes are: individual characteristics, system quality characteristics, organisational culture, macro-environment factors, behavioural beliefs and attitudes, effort perception, social influence, facilitating conditions and other.

Individual characteristics deal with age and the readiness for change of the managers. Organisational factors focus on management support of SAP BI, user participation in the implementation, user training and the iterative development approach of SAP BI reports. System quality characteristics are concerned with information quality, system quality, accessibility and the user interface of the SAP BI tool. Organisational culture deals with information readiness, information culture and change management and macro-environment factors with the relevant business sector and competitiveness of the environment. Effort perception is the user's view on how easy the tool is to use. Social influence deals with visibility and image of the managers, while facilitation conditions with the technical support and report creation

for SAP BI. The “other” theme deals with placing SAP BI on the managers IPM scorecard. These themes are described in the Table 5-1.

**Table 5-1: Dominant emerging themes**

<b>Theme</b>	<b>Description</b>
Individual characteristics	Age, readiness for change
Organisational factors	This deals with focus on the customer, management support, user participation in the implementation, user training and the iterative development approach
System quality characteristics	This deals with information quality, system quality, accessibility and the user interface of the SAP BI tool
Organisational culture	Information readiness, information culture and change management
Macro-environment factors	Relevant business sector, competitiveness of the environment
Behavioural beliefs and attitudes	Relative advantage, and job relevance
Effort perception	Ease of use
Social influence	Visibility and image
Facilitating conditions	Technical support
Other	Placing analytics usage on an individual’s performance management scorecard

Eight respondents across the directorates were interviewed. The interview duration was between ten and fifteen minutes. Table 5-2 provides analysis on feedback from the interviews and identified relevant themes.

**Table 5-2: Mapping of themes to interview documents**

<b>Questions</b>	<b>Key Findings</b>	<b>Theme</b>
How often do you use SAP BI?	There is a general consensus that managers are not using SAP BI.	Organisational factors
What challenges do you face when using SAP BI?	Performance was an issue. The user interface was not intuitive. Data quality was a problem.	System quality characteristics
How do you overcome these challenges?	The super users draw reports in ECC6 which is a lengthy process.	
Have you attended any training? How would you rate the training?	The training is too generic. It should be customised per directorate.	Organisational factors
How do managers obtain data / information when they need to provide reports and supporting evidence to management?	Managers receive the data from the clerks who extract the information on their behalf.	Organisational culture
Do you think if SAP BI was on an individual’s IPM scorecard that usage would improve?	Some managers felt this would definitely help, while others questioned the measurement and reliability of this.	Other

The general consensus from the interviews is that managers are not using SAP BI. Managers appreciate the value of reporting, however, they are not extracting the information themselves. Many of the managers are receiving reporting information from their assistants or clerks. They are not using the tool frequently and, as a result, find the user interface difficult and cumbersome to use. They, therefore, resort to assistance from their staff as the latter can extract the required information far more quickly than they can. The managers stated that the SAP BI training needs to be customised to their specific environment. The current training approach is more generic and deals with navigation around the tool. Customising the training would result in tailored specific needs for an area, that is, financial reporting, human resources reporting or property management reporting. Data quality is a concern for the managers consuming SAP BI. Often, the SAP BI batch is completed with errors, resulting in data being incorrect. This casts doubt on the reliability of the data and results in managers using SAP R/3 instead as the main source of information. Reporting from R/3 is often slow due to the volume of data and results in managers not being able to make timely decisions or react quickly to changing circumstances. Some of the managers felt that performance of the reports were an issue, which resulted in managers not using SAP BI. The managers had different views on placing reporting on managers' IPM scorecard. Some felt strongly that this would enforce usage of the tool, while others felt that it would be counter-productive as managers would merely login to the tool to be "viewed" as using SAP BI. The interview questionnaire transcripts can be found in Annexure C.

### **5.3 Summary**

In this Chapter, the researcher analysed responses from the interviews using thematic analysis. The consensus is that managers are not using SAP BI. They appreciate the value of reporting, however, they are not extracting the information themselves. Many of the managers are receiving reporting information from their assistants. In addition, they are not using the tool frequently and, as a result, find the user interface difficult and cumbersome to use. The researcher's aim was to highlight the feedback that addressed the research questions and where patterns presented themselves in the data. The emerging areas of concern were data quality, training and user interface. Chapter Six presents the findings, recommendations and conclusions of the case study.



## CHAPTER SIX: FINDINGS, RECOMMENDATIONS AND CONCLUSION

### 6.1 Introduction

In the previous Chapter, data from respondents that addressed the research questions and patterns that emerged from the data were highlighted. Emerging areas of concern were data quality, training and user interface. This Chapter outlines the findings in line with the research questions and research objectives presented in Chapter One. It also offers recommendations that could make the organisation more successful. This Chapter concludes and provides insight into management's perception of SAP BI within the organisation and the adoption and usage thereof. It identifies the specific factors that inhibit the usage of analytics in the organisation. To recap, the research addressed the following questions:

- What are the specific factors that inhibit management usage of analytics in the organisation?
  - What is the role of business analytics in the organisation?
  - What is management's perception of analytics?
  - What are the business requirements to implement software that provides business analytics functions?

Specific objectives that emerge from the research questions are:

- To understand the role of business intelligence and business analytics, in particular;
- To understand business requirements to implement business intelligence software. These requirements will be both from technical and social imperatives.

### 6.2 Findings

#### ***The role of analytics in the organisation and management's perception of analytics***

Seventy-seven percent of managers perceive that the organisation promotes information readiness. Management places high value on reporting and appreciates the impact it has on the strategic direction for the organisation. This finding is supported by responses to the electronic survey questionnaire which indicated that 61% of managers confirm that information culture is promoted within the directorates. Fifty-seven percent of managers agreed that SAP BI benefits the public sector and 69% of managers reported that they needed to report on HR, Finance and KPI related information. What has been discovered through the interview process is that a percentage of managers are not drawing the SAP BI reports

themselves, but are requesting their assistants or clerks to fulfil this requirement. As a result the statistics for management usage of SAP BI is skewed and an average of 7% of level 4 managers are using the SAP BI tool.

### ***Specific factors that inhibit the managers' usage of analytics***

This study has shown that SAP BI usage amongst level 4 managers is low and provides reasons for the low usage. The key problem areas that have been established are data quality, user training and the SAP BI user interface.

Recommendations per theme are outlined in Section 6.3.

## **6.3 Recommendations**

### **❑ Individual characteristics**

Individual characteristics deal with age and the readiness for change. The average age of the level 4 managers is forty-nine years old. This cohort typically is not comfortable with technology. The recommendation is to arrange refresher training interventions focused on their specific needs. A blended approach of classroom-based training and e-learning training is recommended. Level 4 managers require hand holding until they are comfortable with the tool. Classroom-based training will be beneficial, whilst they can recap using the e-learning lessons in their offices.

### **❑ Organisational factors**

Organisational factors deal with management support of SAP BI, user participation in the implementation, user training and the iterative development approach.

It is recommended that a process owner be established for analytics to instil a stronger management support base for SAP BI. This individual needs to be at an executive level and should be a champion to promote analytics culture within the organisation. A further recommendation is crafting a SAP BI strategy with a holistic view on technology, processes and human imperatives to ensure successful adoption, usage and sustainability of the tool.

It is further recommended that training be tailored per directorate to address specific reporting requirements per area. Currently, training is more generic and benefits will be achieved if the training model is adapted accordingly.

## ❑ **System quality characteristics**

System quality characteristics deal with information quality, system quality, accessibility and the user interface of the SAP BI tool.

Firstly, it is recommended that SAP BI batch monitoring be implemented to ensure information and system quality. This will require 24/7 monitoring. If a process chain fails, a BI developer is contacted after hours to address the problem specifically around month-end and SAP month-end. Improved data quality will result in improved trust by the business in the reports.

Secondly, it is recommended that the IT department put measures in place to ensure data integrity by monitoring BI batch processes and ensuring that alerts are in place if a process fails. For business to adopt analytics as one version of the truth data integrity is critical to instill confidence of users in SAP BI.

A third recommendation is that performance tuning be undertaken, such as the use of SAP Hana, to create significant performance gains for the users, leading to renewed enthusiasm for the usage of the tool as long delays will no longer be an issue.

The last recommendation is to address the user interface by empowering managers to use the tool by offering refresher SAP BI training that meets specific needs and requirements.

## ❑ **Organisational culture**

Organisational culture deals with information readiness, information culture and change management. The previous recommendation under organisational factors, to establish a process owner is equally important for organisational culture. Establishing a process owner for analytics and with constant executive support for the tool will change the reporting culture within the organisation over time. This ensures that the right information is available at the right time to managers and will create a foundation for information readiness and uptake of the SAP BI tool.

## ❑ **Macro-environment factors**

Macro-environment factors deals with the relevant business sector and competitiveness of the environment. The organisation is a public sector concern and focuses on customer, not profit. Profitable organisations need to have a competitive edge and reporting is an enabler for them to remain successful. It is recommended that the organisation re-orientates its culture towards using analytics. The information culture of the public sector requires a mind shift for managers to realise that analytics is an enabler to assist in supporting the customer more efficiently and

to improve service delivery. This shift could be established once a process owner has been established and could result in changing the organisational culture towards analytical capabilities.

#### ❑ **Effort perception**

Effort perception is the users view on how easy the tool is to use. Managers expressed that they struggled with the interface. Focussed and customised refresher SAP BI training is recommended.

#### ❑ **Social Influence**

Social influence deals with visibility and image. The establishment of a process owner for SAP BI is essential as mentioned previously in organisational factors and organisational culture. This will set the tone at the top and other managers will follow suite. The information and organisational culture towards reporting will mature over time due to the executive support and buy-in of the tool.

#### ❑ **Facilitation conditions**

Facilitation conditions deals with the technical support and report creation for SAP BI. Currently, the development of a SAP BI report is a two-pronged approach in that the BI developer and functional business analysts' input is required. The functional analysts are involved with project and support work and capacity is an issue. This is impacting on the lengthy timelines to create reports, which is frustrating the users. It is recommended that different personnel deal with support and project-related work. This should eliminate delays in report delivery timelines.

#### ❑ **Other**

The "other" theme deals with placing SAP BI on the managers IPM scorecard. Once a process owner has been established this recommendation can possibly be introduced into the organisation. SAP BI usage can be monitored by the number of loggings into SAP BI in a month. Statistics can also be setup on frequently used reports and dashboards. Only what gets managed, gets done. Behaviour will eventually change and an information culture will be instilled into the organisation.

## **6.4 Conclusion**

In conclusion, analytics is the enabler for success for the organisation under study. Managers need to make informed and timely decisions based on facts to stay abreast of competition, improve service delivery, have awareness of changing markets and to streamline processes. Analytics is a driver in achieving these objectives and ensuring success and sustainability for the organisation. It has been established that usage of analytics is low within the organisation under study and there are specific factors that are contributing to managers not using the analytical tools. Interviews and electronic survey questionnaires have highlighted the main causes for low usage. The key areas to address are to establish a process owner at an executive level and to craft an analytics innovation strategy that includes processes, technology and people. The organisation has focussed on technology. However it has neglected the people component. People are critical to the success of any technology as the value of the toolsets is in the actual usage, which increases return on investment. To balance the people component, customised training must be implemented. To establish confidence in data quality, batch monitoring must be implemented with immediate effect. These initiatives could change the organisation and information culture over time and entrench analytics, creating a flourishing and successful organisation.

## REFERENCES

- Bawden, D. 2001. Information and digital literacies: a review of concepts. *Journal of Documentation*, 57(2):218-259.
- Brother, B. 2013. Organisations should manage big data as an asset, say experts. *Computer Weekly*, (March):6-8.
- Carneiro, A. 2006. Adopting new technologies. *Handbook of Business Strategy*, 7(1):307-312.
- Cennamo, L. & Gardner, D. 2008. Generational differences in work values, outcomes and person-organisation values fit. *Journal of Managerial Psychology*, 23(8):891-906.
- Chan, T.C. & Hernandez, J. 2011. CRM Analytics : shifting the balance. *Customer Relationship Management*, (August):10.
- Conkright, T.A. 2015. Using the four functions of management for sustainable employee engagement. *Performance Improvement*, 54(8):15-21.
- David, F.R. & David, F.R. 2015. *Strategic Management Concept and Cases*. (15th ed). England: Pearson Education Limited.
- De Waal, A.A. 2002. The power of world-class performance management: use it! *Measuring Business Excellence*, 6(3):9-19.
- Du Plooy-Cilliers, F., Davis, C. & Bezuidenhout, R. 2015. *Research Matters*. Cape Town: Juta & Company Ltd.
- Du Toit, G., Erasmus, B. & Strydom, J. 2010. *Introduction to business management*. (8th ed). Cape Town: Oxford University Press.
- Ellis, T.J., Levy, Y. & Lauderdale, F. 2008. Framework of problem - based research - a guide for novice researchers on the development of a research - worthy problem. *The International Journal of an Emerging Transdiscipline*, 11:17-33.
- Gartner. 2016. A guidance framework for assessing BI maturity. *Cape Town*. <https://www.gartner.com/doc/1405700/guidance-framework-assessing-bi-maturity> [17 April 2016].
- Gillon, K., Aral, S., Lin, C.-Y., Mithas, S. & Zozulia, M. 2014. Business analytics: radical shift or incremental change? *Communications of the Association for Information Systems*, 34(13):287-296.
- Goldstein, J. 2015. Digital technology demand is transforming HR. *Workforce Solutions Review*: 28-30. [http://ihrimpublications.com/WSR\\_Online\\_Archives/WSR\\_JAN2015-Jill Goldstein.pdf](http://ihrimpublications.com/WSR_Online_Archives/WSR_JAN2015-Jill Goldstein.pdf) [29 September 2016].
- Grubljesic, T. & Jaklic, J. 2015. Conceptualization of the business intelligence extended model. *Journal of Computer Information Systems*, 55(3):72-82.
- Haug, A. & Arlbjørn, J.S. 2011. Barriers to master data quality. *Journal of Enterprise Information Management*, 24(3):288-303.
- Hendricks, J. & Cope, V. 2012. Generational diversity: what nurse managers need to know. *Clinical pharmacology and therapeutics*, 92(2):1-2.
- Hendricks, J. & Cope, V. 2013. Generational diversity: what nurse managers need to know. *Journal of Advanced Nursing*.
- Karahanna, E., Straub, D.W. & Chervany, N.L. 1999. Adoption across technology

- information time : A cross-sectional comparison of pre-adoption and post-adoption beliefs. *MIS Quarterly*, 23(2):183-213.
- Kim, H. 2011. The effects of switching costs on user resistance to enterprise systems implementation. *IEEE Transactions on Engineering Management*, 58(3):471-482.
- Klatt, T., Schlaefke, M. & Moeller, K. 2011. Integrating business analytics into strategic planning for better performance. *Journal of Business Strategy*, 32(6):30-39.
- Klobas, J.E. & Clyde, L.A. 2001. Social influence and internet use. *Library Management*, 22(1/2):61-68.
- Knapp, M. & Hasibether, F. 2011. Material master data quality. *Proceedings of the 2011 17th International Conference on Concurrent Enterprising (ICE 2011)*, (Ice):1-8.
- Koronios, A. & Baškarada, S. 2013. Data, Information, Knowledge, Wisdom (DIKW): A semiotic theoretical and empirical exploration of the hierarchy and its quality dimension. *Australasian Journal of Information Systems*, 18(1):5-24.
- Laerd Statistics. 2013. SPSS tutorials and statistical guides. <https://statistics.laerd.com> [29 September 2016].
- Leming, R. 2015. Why is information the elephant asset? An answer to this question and a strategy for information asset management. *Business Information Review*, 32(4):212-219.
- Macky, K., Gardner, D. & Forsyth, S. 2008. Generational differences at work: introduction and overview. *Journal of Managerial Psychology*, 23(8):857-861.
- Marsh, R. 2005. Drowning in dirty data? It's time to sink or swim: A four-stage methodology for total data quality management. *Journal of Database Marketing & Customer Strategy Management*, 12(2):105-112.
- Marshall, A., Mueck, S. & Shockley, R. 2015. How leading organizations use big data and analytics to innovate. *Strategy & Leadership*, 43(5):32-39.
- Moody, D. & Walsh, P. 1999. Measuring the value of information: an asset valuation approach. *Seventh European Conference on Information Systems (ECIS'99)*:1-17.
- Nabi, G. & Liñán, F. 2011. Graduate entrepreneurship in the developing world: intentions, education and development. *Education + Training*, 53(5):325-334.
- Narayanan, V.K. 2015. Customer-focused IT: a process of continuous value innovation. *Strategy & Leadership*, 43(4):11-17.
- Nel, P., Werner, A., Botha, C., Du Plessies, A., Mey, M., Ngalo, O., Poisat, P. & Van Hoek, L. 2014. *Human Resources Management*. Cape Town: Oxford University Press.
- Oz, E. & Jones, A. 2008. *Management information systems*. (5th ed). London: Cengage Learning EMEA.
- Pallant, J. 2007. *A step by step guide to data analysis using SPSS for Windows*. (3rd ed). New York: Open University Press.
- Perran, A., Perran, S., Mason, J. & Rogers, L. 2013. Building business solutions. In *Beginning SharePoint 2013: Building Business Solutions*. Indianapolis: John Wiley & Sons:1-8.
- Quan, X. 2012. Prior experience, social network, and levels of entrepreneurial

- intentions. *Management Research Review*, 35(10):945-957.
- Rowley, J. 2007. The wisdom hierarchy: representations of the DIKW hierarchy. *Journal of Information Science*, 33(2):163-180.
- Ruhode, E. 2016. E-Government for Development: a Thematic Analysis of Zimbabwe's Information and Communication Technology Policy Documents. *The Electronic Journal of Information Systems in Developing Countries*, 73(7):1-15.
- Saha, P., Nath, A.K. & Salehi-Sangari, E. 2012. Evaluation of government e-tax websites : an information quality and system quality approach. *Transforming Government: People, Process and Policy*, 6(3):300-321.
- SAP. 2016a. About SAP. <http://go.sap.com/corporate/en/company.html> [11 April 2016].
- SAP. 2016b. SAP Business Warehouse. [http://help.sap.com/saphelp\\_nw74/helpdata/en/46/8c635be4c70ad3e10000000a11466f/frameset.htm](http://help.sap.com/saphelp_nw74/helpdata/en/46/8c635be4c70ad3e10000000a11466f/frameset.htm) [10 April 2016].
- SAP. 2016c. SAP BusinessObjects Web Intelligence. <http://scn.sap.com/community/businessobjects-web-intelligence> [12 April 2016].
- SAP. 2016d. SAP Data Migration Methodology. <http://scn.sap.com/docs/DOC-40406> [13 April 2016].
- Smith, I. 2011. Organisational quality and organisational change: Interconnecting paths to effectiveness. *Library Management*, 32(1/2):111-128.
- Stephen, M.K. & Kleiner, B.H. 2011. Better data means better decisions. *Industrial Management*: July / August. 23-25.
- Sun, J., Ahluwalia, P. & Koong, K.S. 2011. The more secure the better? A study of information security readiness. *Industrial Management & Data Systems*, 111(4):570-588.
- Swanepoel, B., Erasmus, B. & Schenk, H. 2008. *South African human resource management theory & practice*. (4th ed). Cape Town: Juta & Co Ltd.
- Tavakol, M. & Dennick, R. 2011. Making sense of Cronbach's alpha. *International Journal of Medical Education*, 2:53-55.
- Vakola, M. & Nikolaou, I. 2005. Attitudes towards organizational change: What is the role of employees' stress and commitment? *Employee Relations*, 27(2):160-174.
- Van Seggelen, I. & Van Dam, D.K. 2015. Self-reflection as a mediator between self-efficacy and well-being. *Journal of Managerial Psychology*, 31(1):18-33.
- Venkatesh, V. & Bala, H. 2008. Technology acceptance model 3 and a research agenda on interventions. *Decision Sciences*, 39(2):273-315.



## ANNEXURES

### Annexure A: Questionnaire to determine the role of analytics in management decision making

SA = Strongly Agree, A=Agree; N=Neutral; D=Disagree; SD=Strongly Disagree

#### FACTORS INFLUENCING USAGE / ADOPTION OF BUSINESS ANALYTICS

##### 1. Individual Characteristics

1.1 Readiness for change	SA 5	A 4	N 3	D 2	SD 1
Q1. You are comfortable experimenting with new technology.					

##### 2. Business Intelligence Systems Quality Characteristics

2.1 Information quality	SA 5	A 4	N 3	D 2	SD 1
Q2. SAP Business Intelligence (SAP BI) information quality is trustworthy.					

2.2 System quality	SA 5	A 4	N 3	D 2	SD 1
Q3. The performance is good when executing SAP BI reports and dashboards.					
Q5. It is easy to navigate, search and retrieve information in the SAP BI tool.					

2.3 Accessibility	SA 5	A 4	N 3	D 2	SD 1
Q4. Obtaining SAP BI access is straight forward.					

2.4 User interface	SA 5	A 4	N 3	D 2	SD 1
Q5. It is easy to navigate, search and retrieve information in the SAP BI tool.					
Q3. The performance is good when executing SAP BI reports and dashboards.					

##### 3. Organisational Factors

3.1 Focus on the customer	SA 5	A 4	N 3	D 2	SD 1
Q6. SAP BI will improve service delivery.					

SA = Strongly Agree, A=Agree; N=Neutral; D=Disagree; SD=Strongly Disagree

3.2 Management support	SA 5	A 4	N 3	D 2	SD 1
Q7. Management promotes the usage of SAP BI.					
SA = Strongly Agree, A=Agree; N=Neutral; D=Disagree; SD=Strongly Disagree					

3.3 User participation in implementation	SA 5	A 4	N 3	D 2	SD 1
Q8. The SAP BI implementation team considered your input when rolling-out SAP BI in 2006.					

3.4 Iterative development approach	SA 5	A 4	N 3	D 2	SD 1
Q9. You have requested a SAP BI (report or dashboard) to be developed for your specific business needs.					
Q10. The turnaround times for the SAP BI developments were satisfactory.					
Q11. Your business requirements were adequately met in the newly developed report.					

3.5 User training	SA 5	A 4	N 3	D 2	SD 1
Q12. You have received SAP BI classroom-based training.					
Q13. The SAP BI classroom-based training was effective.					
Q14. The SAP BI dashboards and reports are easy to understand.					
Q15. The SAP BI E-Learning training is easy to find on the portal.					
Q16. The SAP BI E-Learning training is effective.					

3.6 Organisational culture	SA 5	A 4	N 3	D 2	SD 1
Q17. The organisation promotes information readiness.					

3.7 Information culture	SA 5	A 4	N 3	D 2	SD 1
Q18. Information culture is promoted within your directorate, namely data transparency, using SAP BI as the corporate reporting tool.					
Q21. SAP BI provides your team with a competitive advantage.					

SA = Strongly Agree, A=Agree; N=Neutral; D=Disagree; SD=Strongly Disagree

3.8 Change management	SA 5	A 4	N 3	D 2	SD 1
Q19. Management actively promotes and supports SAP BI.					
Q13. The SAP BI classroom-based training was effective.					

#### 4. Macro-Environment Factors

4.1 Business sector	SA 5	A 4	N 3	D 2	SD 1
Q20. SAP BI benefits the public sector.					

4.2 Competitiveness of the environment	SA 5	A 4	N 3	D 2	SD 1
Q21. SAP BI provides your team with a competitive advantage.					

#### 5. Behavioural Beliefs and Attitudes

5.1 Relative advantage	SA 5	A 4	N 3	D 2	SD 1
Q21. SAP BI provides your team with a competitive advantage.					

5.2 Job relevance	SA 5	A 4	N 3	D 2	SD 1
Q22. You require the following reporting information to enable management decisions in the following areas: HR Finance and KPI related information.					

#### 6. Effort perception

6.1 Ease of use	SA 5	A 4	N 3	D 2	SD 1
Q4. It is easy to navigate, search and retrieve information in the SAP BI tool.					
Q14. The SAP BI dashboards and reports are easy to understand.					

#### 7. Social influence

7.1 Visibility	SA 5	A 4	N 3	D 2	SD 1
Q23. You are required to use SAP BI reporting as evidence for day-to-day business reporting activities.					

SA = Strongly Agree, A=Agree; N=Neutral; D=Disagree; SD=Strongly Disagree

7.2 Image	SA 5	A 4	N 3	D 2	SD 1
Q19. Management actively promotes and supports SAP BI.					

8. Facilitating Conditions	SA 5	A 4	N 3	D 2	SD 1
Q24. The technical support for SAP BI issues is good.					

9. Other	SA 5	A 4	N 3	D 2	SD 1
Q25. Analytics usage will improve if placed on an individual's performance management scorecards.					

<b>Other Comments:</b>

## **Annexure B: Interview questionnaire to determine the role of analytics in management decision making**

**The researcher introduced the case study and shared the aims of the case study to the Manager being interviewed**

- On average how often do you use SAP Business Intelligence?
- Do you experience any challenges when using SAP Business Intelligence?
- How do you overcome these challenges?
- Have you had any training in SAP Business Intelligence?
  - Classroom / E-Learning
  - Was it effective?
  - What, in your opinion, would make the training more effective?
- How do you obtain your data / information when you need to provide reports & supporting evidence to Management?
- What, in your opinion, will improve the usage of SAP Business Intelligence?
  - Will placing this on an individual's IPM scorecard help?
- Please share any other comments?

## Annexure C: Interview questionnaire transcripts

Directorate 1	
Respondent	Details
Researcher	The researcher provided a brief overview of the case study and the objectives she is hoping to achieve. The main objectives are to find out what the reasons are for the usage of SAP BI amongst level 4 managers.
Respondent 1	The managers are pro SAP BI but there are no drivers to enforce it.
Researcher	How often do you use SAP BI?
Respondent 1	Not often. More monthly. It changes as there is a need for something or someone makes an enquiry, only then will I draw on stats from BI. Please clarify that we are talking about the Corporate Reporting and Corporate Dashboards tab.
Researcher	Correct - it is those two specific tabs. What challenges do you face when using SAP BI?
Respondent 1	The main challenges are that I don't work enough on the tool. I don't always find my way around the tool correctly. The windows where you have to select the fields - it is not always clear what to select. Perhaps it's just education on my side that I need to know a bit more.  Standard reports that are setup on the financial side - the Cost Centre report you need to know what to select. The variable screen is confusing. I often eventually just give up and ask the HR or Finance guys to help. I have to ask someone to help.
Researcher	I agree that the finance reports are confusing; it is not clear what to use.
Researcher	Have you attended any training?
Respondent 1	Yes I went twice because I keep forgetting. In the training they show a lot of city wide reports that are available. You are in the classroom with other directorates and it is overwhelming. Perhaps if it was specific to a department it may be more valuable. People can relate to the data more. The business could get a team of ten managers to conduct the training specific to their area and needs.  Alfonso and I are pro BI and create awareness for BI. I said we should get all the level 4 managers scheduled for BI training and they have to do it. They don't follow through and it never happens. It all depends on management style - is it more important to put out fires on the operational issues than to attend BI training.
Researcher	How do they obtain data / information when they need to provide reports and supporting evidence to management?
Respondent 1	Managers are not using BI. They get the information from Clerks; it is not always from BI (most of the cases not BI). It could be from SAP and they populate the data in a spreadsheet. An example the other day, I got a

Directorate 1	
Respondent	Details
	<p>spreadsheet from a depot - a cost centre spreadsheet running from 2007 to 2015. The guy had individually extracted the data per year and then he pasted them all together and the challenge was to get all cost elements to be in one line. The cost elements varied during the year, it was not aligned. So he sent it to me and asked if I could please align this for him. If it's too much, I must not worry. But then I thought this surely can be done in BI. So I tried to get the report from BI but was not sure what cost centre report to use. You should be able to do it in SAP BI. I eventually gave up and sent it on to our finance section.</p> <p>This poor guy is doing a lot of work and if the manager had known that this was available on SAP BI he could have done it himself.</p>
Researcher	Do you think if BI was on an individual's IPM that usage would improve?
Respondent 1	Yes, it must be in your WSP and IPM.
Respondent 1	<p>The AG is here. They require info. They need a 3 day turnaround time. So one needs to be able to extract reliable information quickly. If I ask information from someone and it takes 2 to 4 weeks for staff to get it - then surely they are not using SAP BI if it is taking this long to get information. That could be a measurement, how quick are you to respond to information. You could build a timeline in to say on a monthly basis these are the types of information required within 7 days. If they don't make it in 7 days then start looking, where are you looking for the data and how do they compile it. Get the guys to say we are using the wrong system. We have to train ourselves in BI and this is the system we should be using.</p>
Researcher	What are the key take away's from the interview?
Respondent 1	<p>The main thing is that there is a positive view on BI - just that the follow through is not there. We are positive but we need a bit of a push to get it done. Corporate could advise in getting it on the scorecards. Especially from my side I don't always know where is my boundary - who am I to tell the director - you have got to use this system. I could be nice and hold hands but somewhere they need to accept it and do it themselves. The culture is that Respondent 1 and a few others know how to do it quickly so they rather ask them to do it than themselves. There are a couple of us that are the go-to people. We need to be more assertive and say you do it on your own.</p>
Respondent 1	I need someone from BI to assist in how to do things in BI. We would also like to create a new dashboard development, to take the dashboards down to the depot level.
Researcher	We are more than willing to assist in this development. A visual dashboard is always more effective. Please log a call at the SAP Helpdesk. The development time is not quick as we need to get the functional involved as well.
Respondent 1	That is the challenge, that it takes SAP & IT a long time to develop solutions.

<b>Directorate 1</b>	
<b>Respondent</b>	<b>Details</b>
Researcher	The researcher thanked respondent 1 for her time and input.



Directorate 2	
Respondent	Details
Researcher	The researcher provided a brief overview of the case study and the objectives she is hoping to achieve. The main objectives are to find out what the reasons are for the usage and adoption of SAP BI amongst level 4 managers.
Researcher	How often do you use SAP BI?
Respondent 2	Depends on whether we do an adjustment budget or draft budget, but normally about five times in a month.  Because I'm a systems type of person I rely on other sources in addition to SAP BI but for others that don't have that and have to use SAP BI.
Researcher	What challenges do you face when using SAP BI?
Respondent 2	The main challenges are the batch - for the past 4 adjustment budgets I could not use the workbooks. Everything that needs to be automated I could not use. There is also one report that I use - I check the plans in version 0 with the budget in PS with latest approved plan in PPM that is supposed to be balancing but mostly that report is not functioning, the batch didn't run or wrong information in it. I would love to use it more - I would use it daily if I trusted the information. Most of the problems are the loads and archiving.  I draw on my own systems if SAP BI is not available. Only problem is at month end. I cannot get the actuals at a period in R/3. For period related reporting I need SAP BI.
Researcher	Have you attended any training?
Respondent 2	I did a half day of training. I'm not an expert in BI. One should teach one self.
Researcher	How do you obtain data / information when you need to provide reports and supporting evidence to management?
Respondent 2	As mentioned I have my own systems if SAP BI is not available. I draw on R/3 for information.  At month end I cannot get the actuals at a period in R/3 - period related reporting I need SAP BI. For our reporting on the quarterly scorecards we have to use BI because in three years time you will have to be producing the exact result.
Researcher	How can we improve SAP BI usage?
Respondent 2	The batch should be effective and accurate. You need to cut out people like me who spoon feed the business. They know they can get information at half of the time so they always come to me. I deal with Finance Managers and they don't see the need to learn it because I always give them the information - I should refer them to SAP BI more.
Researcher	Do you think if BI was on an individual's IPM that usage would improve?

<b>Directorate 2</b>	
<b>Respondent</b>	<b>Details</b>
Respondent 2	I don't think so. How would you measure that?
Researcher	You could draw stats on logins to BI and frequently run reports.
Respondent 2	Managers have their side-kicks that run reports for them so you'll never get a proper view of usage.
Researcher	Any questions?
Respondent 2	Is there any archiving on the cards?
Researcher	There is a new drive for document management control. This will be a lengthy process as we need to engage with business to check what documents can be stored to disk. Once stored the information will still be accessible.
Respondent 2	We need to establish the old WBS elements that are not closed. It could improve data loading to PPM. Once closed they will be ignored when loaded. I asked PM to provide a list so that business can drive this to get these old orders closed.
Researcher	Business should be driving this - I agree. The researcher thanked respondent 2 for her time and input.

Directorate 3	
Respondent	Details
Researcher	The researcher provided a brief overview of the case study and the objectives she is hoping to achieve. The main objectives are to find out what the reasons are for the usage and adoption of SAP BI amongst level 4 managers.
Researcher	How often do you use SAP BI?
Respondent 3	I use SAP BI daily.
Researcher	What challenges do you experience when using SAP BI?
Respondent 3	It is pretty straight forward. The only challenge is when the network is a bit "wonky". Sometimes when you're pulling large amounts of data it can be a bit slow and if you're impatient like me it can be frustrating. But otherwise there are no real issues or drawbacks that I have experienced.
Researcher	How do you obtain data / information when you need to provide reports and supporting evidence to management?
Respondent 3	If the info is only available on BI then we have to wait. Otherwise I will use the back-end to extract the info from the different tables and do my own analysis. It does take a bit longer, for example, the vacancy report, it immediately gives you all the necessary info I need, e.g. the period it was vacant. If the vacancy report is not working which was only once or twice that there was something wrong with it, then I have to extract on the back-end, for example, the vacant positions, starting dates from when the relationship to the older and obviously it takes a lot longer. BI gets info from SAP anyway. Only with BI, a touch of the button provides the results immediately.
Researcher	Have you attended any training?
Respondent 3	Right when they started off. I was part of the pilot. I remember Shaun gave the training and only finance reports were available at that stage. It was the feel and the look of BI and how to run reports. The screens and pop ups. It was a brief overview. It is simple enough to guide yourself through the process.
Researcher	How can we improve SAP BI usage?
Respondent 3	I think management relies too much on their support staff to provide reports. Sometimes these support staff don't know why they are extracting the information. A lot of the time they extract the wrong data. The interpretation of the info is like a broken telephone. What the manager asked and what he eventually gets is not what is needed. We need a dedicated type of focussing on taking level 3 managers and not directors as they have a different focus. Level 3 support managers don't know how to run BI. They rely on clerks to extract the data and they don't necessarily have the analytical expertise and knowledge and what criteria to use and how to analyse and interpret the data. It's easy to extract data but how do you present it. I work with a lot of HR data and I see how our support managers present this data at portfolio committees which is totally wrong.

<b>Directorate 3</b>	
<b>Respondent</b>	<b>Details</b>
	<p>We need a dedicated drive to focus on our HR business partners and support managers throughout the city and to get them to draw their own reports. They service all the other managers and if we get this right at this tier - they can give the rest of the management the tool to show them how to do this report. It needs a dedicated effort or carrot to get this right. If they don't experience what they can extract then they won't see the value of it. We have started Management Accountability Programme and whenever they do the OM side I show them all the BI reports in the HR space. It looks like the curtains open up when they see this. There is a flurry of requests for information and reports but it eventually dies down. They don't always know what reports are there. As soon as there is a new report - it needs to be sent out to all the support managers. I'm not sure who should spread the news - Management News. We need awareness. I setup a workshop with all the BP and Support Managers to run them through the reports. Then the ODTP kicked in and everything was placed on hold.</p> <p>Another suggestion is to have a hovering option over a report that provides a detail on the report - perhaps a Noddy Guide.</p>
Researcher	Do you think if BI was on an individual's IPM that usage would improve?
Respondent 3	<p>No I don't think this will work. That is using the whip. I don't think it should be coupled to your performance as it will be difficult to prove and to measure. If you use the reports it will have an indirect impact on your outputs and performance. I do think you will be stupid not to use BI because you won't be as effective in your job. Linking directly to IPM will be difficult to measure as people will just start using reports for the sake of using reports. It won't be effective.</p>
Researcher	The researcher thanked respondent 3 for his time and invaluable feedback.

<b>Directorate 4</b>	
<b>Recipient</b>	<b>Details</b>
Researcher	The researcher provided a brief overview of the case study and the objectives she is hoping to achieve. The main objectives are to find out what the reasons are for the usage and adoption of SAP BI amongst level 4 managers.
Researcher	How often do you use SAP BI?
Respondent 4	I use the SAP BI report for training or labour relations matters. However, my staff do provide information as well that I use for report purposes. I also use the corporate reporting, checking the vacancies and absenteeism.
Researcher	What challenges do you experience when using SAP BI?
Respondent 4	For me it is very useful. Sometimes I do experience it to be a bit slow, but I think a lot of people are using it. I am also sitting on a different network - but Paul Sauer is slow. If I select a person's attendance for absenteeism, then sometimes it is not available. Then I will need to go back into it later. When BI is up and running its fine.
Researcher	How do you obtain data / information when you need to provide reports and supporting evidence to management?
Respondent 4	I rely on BI as well. For absenteeism I only go in at a specific point in time because people clock-in and it will only be available after 14:00. If the information is not available I ask the team as a backup to provide the information. For the vacancy analysis, the abolishment of positions take a lot of time. I would like to see a better link between Corporate HR and IT specifically for the abolishment of posts. I raised this at the HR forum meeting - why are we waiting till the end of the month for appointments. It puts pressure as our reports are affected. At least make appointments by the 25 <sup>th</sup> of the month.
Researcher	Have you attended any training?
Respondent 4	I was trained many years ago. No, the training was effective, but at that time it was not like all the things you see today - we didn't have the dashboards and other reports.
Researcher	How can we improve SAP BI usage?
Respondent 4	We need to make sure that the link between Corporate HR and IT for the abolishment of posts is up and running frequently so that the information is correct.
Researcher	Do you think if BI was on an individual's IPM that usage would improve?
Respondent 4	I think it will. It must be an instruction. It mustn't be an option or a choice. Now that it is on the system you can see thumbs up or thumbs down. It must be part of their daily operations.
Respondent 4	I would like to take this opportunity to say thank you to the team. It helps me a lot. We need to maintain the momentum.
Researcher	The respondent was thanked for his time and invaluable feedback.

Directorate 5	
Respondent	Details
Researcher	The researcher provided a brief overview of the case study and the objectives she is hoping to achieve. The main objectives are to find out what the reasons are for the usage and adoption of SAP BI amongst level 4 managers.
Researcher	How often do you use SAP BI?
Respondent 5	Not much, about twice a month - as needed.
Researcher	What challenges do you face when using SAP BI?
Respondent 5	<p>When we started off, yes, and once one understands the inner workings and understanding the dates it gets better. Performance management is also one of my duties, information is key, and integrity is key. There are different reporting levels in the City, and when the ED has his dashboard with the Mayor, I will rather use the BI report information as opposed to the info I get from the departments and the Mayor receives her information from SAP. I've discovered that the hard way previously where my ED came back and said that our information varies from the Mayors information. She asks for info and then compares</p> <p>In the beginning if we look at quarterly stats the dates would not coincide with what we got from the departments. 98% it's human error and their understanding of how they report when they capture on SAP. And so I still prefer to use the BI report and then go back to them to say that what you gave me does not correspond with BI.</p>
Researcher	Have you attended any training?
Respondent 5	I went to the normal SAP BI training many moons ago. So I can't remember and a lot of developments have changed over time.
Researcher	How do you obtain data / information when you need to provide reports and supporting evidence to management?
Respondent 5	Backup from the departments in combination with BI.
Researcher	How can we improve SAP BI usage?
Respondent 5	I would think that certain issues should be made compulsory in terms of information and reporting and in that way it should be linked to performance management - be it IPM, or directorate or departmental performance. We have the issue that the information can't be right because this is what we recorded on the Departmental etc. I would like people to be forced to use SAP BI. And report from there and if there is a discrepancy the departments can explain the discrepancy. We have a problem with the rates of filling vacancies - the SAP report versus what we get from the Departments. The C3 notifications - we have a performance of 125% not understanding that the dates overlap. You open a request for service / complaint and close it towards the end of the quarter - you deal with it but only close it in the new period. We need to force people to use BI. With every computer programme, it's what you put in, is what you get out.

<b>Directorate 5</b>	
<b>Respondent</b>	<b>Details</b>
	<p>Another challenge is OHS reporting. We pull info from SAP and it is way below 30% and then we talk to Jerry and understand why. The IOD is recorded but they are not closing it on SAP. In some way or form we need a directive to use the BI reports.</p> <p>So to answer your question, is to be on IPM or a directive from the City Manager that we only use SAP BI. It's a hard approach but it's the only way to change the mind-set of managers.</p> <p>The lower levels work a lot on SAP BI, so as managers we should be able to go into BI and extract it quickly. We are embarking on EPIC and will start using that reporting going forward.</p>
Researcher	The researcher thanked respondent 5 for his time and input.

<b>Directorate 6</b>	
<b>Respondent</b>	<b>Details</b>
Researcher	The researcher provided a brief overview of the case study and the objectives she is hoping to achieve. The main objectives are to find out what the reasons are for the usage and adoption of SAP BI amongst level 4 managers.
Researcher	How often do you use SAP BI?
Respondent 6	On average 8 times a month. I am quite forced - I have performance management under me and the C3 so I have to use the tool.
Researcher	What challenges do you face when using SAP BI?
Respondent 6	<p>Yes, I have. It's not as user-friendly as it could be. You have to know the account number to go where you want to go. It's not a natural flow. The other instance is the info is incorrect, for example, SAP Prod, SAP BI and what was the directorates absenteeism rate and they all give different answers. I've had fights with HR, IT and OPRG. We need to report on absenteeism with a touch of a button and we don't want our specialist to have to calculate this information and waste time. Arts and Culture Department has joined our directorate and they are included in some of the reports and others not. HR Org and Finance don't have the same source / database. For instance, our disabled figures, we met the target, if you go on one of the dashboards you don't meet the target - it's unacceptable. It should have one source.</p> <p>The two main issues are unreliability of the information and it's not user-friendly enough.</p>
Researcher	Have you attended any training?
Respondent 6	No - self trained and asked people who know how.
Researcher	How do you obtain data / information when you need to provide reports and supporting evidence to management?
Respondent 6	SAP Production. The support manager needs to go to SAP Production - download the whole staff quota, calculate the number of absences. It's much longer to get the info.
Researcher	How can we improve SAP BI usage?
Respondent 6	Firstly, that they are confident the info is reliable. Secondly, if BI can evolve itself. We will need processes that force managers to use BI. Thirdly, if you are an ED it is assumed that you use SAP BI - this is not the case. Senior officials need refresher training.
Researcher	Do you think if BI was on an individual's IPM that usage would improve?
Respondent 6	Definitely. If you could have a mechanism to see how often someone visits BI.
Researcher	The researcher thanked respondent 6 for his time and input.



Directorate 3 : Department 2	
Respondent	Details
Researcher	The researcher provided a brief overview of the case study and the objectives she is hoping to achieve. The main objectives are to find out what the reasons are for the usage of SAP BI amongst level 4 managers.
Researcher	How often do you use SAP BI?
Respondent 7	Corporate reporting - no more than once a week. 4 times in a month.
Researcher	What challenges do you face when using SAP BI?
Respondent 7	I think if the system is fast, it's fine. It's more human error, where I have called a report and not put in a proper variant in that it runs long and goes very slow. I close it down and leave it.
Researcher	How do you overcome these challenges?
Respondent 7	<p>I usually just close it down instead of refining my variant. I think it's more on a user point of view - I'm only using it once a week. I'm looking at what is the data coming out (is it up to date) and what are my customers doing? For example my halls usage, this particular hall is not being used - is there something wrong with the hall system being faulty or that the hall is not being used. I use the BI report that way - I look if the front system is up and running. I notice that sometimes the data is not there. It is more process related where the updates have not been captured.</p> <p>From a housing point of view they don't use BI. They use spreadsheets. When we finish the housing project - end of October - then we will drive BI. They don't trust the BI reports - especially from a debt management point of view. The arrangement programme was a challenge and now the arrangement is in SAP so it should be better.</p> <p>I need to get more comfortable with BI and drive it out to business. The circle of trust is missing so it needs to be built and established.</p>
Researcher	Have you attended any training?
Respondent 7	I attended it originally when I was in property management. We attended a session in Pinelands. My new staff have started the online training. Beforehand, I went in to see what it all entails. The online training is easy to follow. I got the link from profiling. My other comment on the online training material is using the portal option - there are two different portal options. The online training portal option one loses all of one's favourites which is confusing. For example I cannot get into Solman after once I've used this portal option. It's a portal / Basis issue - they need to remove one or make them work the same way. This can scare people - when are you meant to use which portal tab option to get into BI. Training was effective - it was clear - quick and easy. When you've done the training you need to do something to make sure you have passed, that they get a notification so that you can get the access. Perhaps you can add this right in the front of the page giving an overview of what you need to do to get the SAP BI access providing the user with clear direction and instructions as to what needs to be done.

Directorate 3 : Department 2	
Respondent	Details
Researcher	How do they obtain data / information when they need to provide reports and supporting evidence to management?
Respondent 7	I provide all my CRM stats to Rudy for SRs, CRs and CDs. I don't use BI for stats reporting to Rudy. I have gone there to have a look as a management tool - we have so many halls bookings - so many graves - it's more the numbers - financial figures etc.
Researcher	How can we improve SAP BI usage?
Respondent 7	I think there is a new breed of managers. We are busy with the strategic assets bookings project. The stakeholder knows a little bit of SAP. He insisted that in the charter that BI reporting is included. Normally the old mind set is to ignore BI and to do it later - it's then excluded from the budget and it never gets done. For all future PIDs - If you want BI you need to let me know what fields do you want - get an idea from the halls booking report and include it upfront. As a manager, what is it you want to report on? Understanding management reporting requirements early on and building the system accordingly.
Researcher	Do you think if BI was on an individual's IPM that usage would improve?
Respondent 7	I think that placing the fact that they need to report on a quarterly basis will help and with BI a couple of quick clicks and it's done. For example, in DAMS they have to prepare stats for Stats SA. How many building plans were accepted, approved? Out of their IPOS system they would extract it in a spreadsheet - it took three days of work. Now in BI it's a click of a button and it's done. However, they knew the format that Stats SA required so it assisted with creating of the BI report. You need to make managers report on a quarterly basis and advise then saying, Managers you shouldn't be doing reporting like that but start using BI. We also have our smoothing report - there is a legal requirement to do smoothing. Finance need to run the smoothing every month. Property management go and run the report on how many leases, and do a comparison what was in the system last month, then finance run the smoothing report and do the comparison.
Researcher	The researcher thanked the respondent for his time and input.

Directorate 8	
Respondent	Details
Researcher	The researcher provided a brief overview of the case study and the objectives she is hoping to achieve. The main objectives are to find out what the reasons are for the usage and adoption of SAP BI amongst level 4 managers.
Researcher	How often do you use SAP BI?
Respondent 8	I would say at least twice a week. About eight times in a month.
Researcher	What challenges do you experience when using SAP BI?
Respondent 8	By and large when I access the system the reports are available and the data is current. About 98% no, there has been the odd occasion when I require information urgently and I go in and I get a BEX error. It's quite difficult to find out from IT who is responsible or who can help. More often than not the tool is working, the information is packaged well and the data is available. I would assume that there are a number of people trying to access the same report as we need to report on a quarterly basis.
Researcher	How do you obtain data / information when you need to provide reports and supporting evidence to management?
Respondent 8	I go to the back-end of SAP Production which is a bit more cumbersome. If I do have problems there I will contact an individual in the ERP to assist.
Researcher	Have you attended any training?
Respondent 8	Yes, it was about 8 years ago - facilitated by Shaun van der Merwe. The training was adequate and it got me started.
Researcher	How can we improve SAP BI usage?
Respondent 8	That question has vexed me for a while. My role and function in City Parks is to encourage the use of BI reports. In our management meetings our senior management, level 3 and our Director, find the information well packaged and easy to use. However, once they leave the meeting they do not draw the report. I'm not too sure why that is. It may be that our senior managers are post 55 age group and are reluctant to engage in technology. They feel they may break it and essentially we have told them that the reporting is read-only. Another reason is that they are weary they may do something that may break the system. Another problem is the lack of IT savvy managers. From my side I think the reports are easy to use and help me in my decision making. People are possibly spoon fed and there is always someone in the department that can help them get the reports. A lot is to do with training, awareness and a willingness to use the tools.
Researcher	Do you think if BI was on an individual's IPM that usage would improve?
Respondent 8	No, that would be difficult to manage. If you are able to come up with a metric that can measure the qualitative use of the reports then I would say yes, but if it's merely quantitative you will get some guys that will just log into the system. It needs a qualitative measure. So, Yes and No.
Researcher	The respondent was thanked for his time and invaluable feedback.

## Annexure D: Statistical data analysis

### Factor Analysis

Communalities		
	Initial	Extraction
Q01	.268	.306
Q02	.408	.370
Q03	.446	.369
Q05	.554	.570
Q04	.521	.547
Q06	.456	.557
Q07	.504	.452
Q08	.468	.419
Q09	.338	.309
Q10	.564	.600
Q11	.613	.851
Q12	.490	.517
Q13	.606	.807
Q14	.531	.532
Q15	.479	.516
Q16	.594	.598
Q17	.602	.594
Q18	.687	.683
Q19	.699	.815
Q20	.465	.457
Q21	.554	.584
Q22	.335	.374
Q23	.481	.628
Q24	.535	.463
Q25	.353	.306

Extraction Method: Maximum Likelihood.

### Total Variance Explained

Factor	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings <sup>a</sup>
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	
1	8.383	33.533	33.533	7.817	31.269	31.269	4.796
2	2.015	8.059	41.592	1.580	6.320	37.589	5.209
3	1.795	7.181	48.773	1.330	5.319	42.908	6.324
4	1.387	5.546	54.319	1.044	4.175	47.083	4.216
5	1.311	5.245	59.565	.875	3.500	50.583	5.044
6	1.037	4.147	63.711	.580	2.321	52.905	4.242
7	.887	3.550	67.261				
8	.782	3.129	70.390				
9	.733	2.934	73.324				
10	.686	2.742	76.066				
11	.627	2.508	78.574				
12	.613	2.454	81.028				
13	.545	2.182	83.210				
14	.518	2.074	85.284				
15	.504	2.017	87.301				
16	.476	1.902	89.204				

**Total Variance Explained**

Factor	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings <sup>a</sup>
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	
17	.458	1.831	91.034				
18	.383	1.532	92.566				
19	.341	1.364	93.931				
20	.327	1.308	95.239				
21	.298	1.192	96.431				
22	.276	1.105	97.536				
23	.235	.942	98.477				
24	.214	.856	99.333				
25	.167	.667	100.000				

Extraction Method: Maximum Likelihood.

a. When factors are correlated, sums of squared loadings cannot be added to obtain a total variance.

**Factor Matrix<sup>a</sup>**

	Factor					
	1	2	3	4	5	6
Q21	.692					
Q18	.692	.403				
Q24	.676					
Q16	.675					
Q13	.675		.368	-.327		
Q14	.635					
Q19	.631	.542				
Q04	.623					
Q05	.622					
Q11	.602	-.534	-.446			
Q08	.601					
Q20	.547					
Q23	.544				.477	
Q12	.543			-.310		
Q17	.528	.465				
Q15	.522				-.371	
Q03	.518					
Q10	.517	-.363	-.431			
Q06	.485			.472		
Q07	.479	.417				
Q09	.428				.310	
Q02	.427			.363		
Q22	.404				.364	
Q25	.373					
Q01			.304			.300

Extraction Method: Maximum Likelihood.

a. 6 factors extracted. 7 iterations required.

**Goodness-of-fit Test**

Chi-Square	df	p-value
248.523	165	.000

**Pattern Matrix<sup>a</sup>**

	Factor					
	1	2	3	4	5	6
Q19	.923					
Q18	.722					
Q17	.684	.323				
Q07	.660					
Q06		.766				
Q01		.608				
Q02		.569				
Q20		.542				
Q03		.451				
Q25		.345			.312	
Q15			.842			
Q04			.744			
Q05			.733			
Q16			.618			
Q14			.443			
Q11				.975		
Q10				.816		
Q24						
Q23					.840	
Q22					.554	
Q09					.459	
Q21					.450	
Q13						.841
Q12						.618
Q08						.338

Extraction Method: Maximum Likelihood.

Rotation Method: Promax with Kaiser Normalization.

a. Rotation converged in 7 iterations.

**Structure Matrix**

	Factor					
	1	2	3	4	5	6
Q19	.890		.409	.309	.433	
Q18	.812	.457	.524	.390	.437	.339
Q17	.717	.490	.399			
Q07	.667		.320		.341	
Q06	.312	.738	.422		.418	
Q20	.396	.649	.458		.480	.319
Q03	.360	.586	.478	.310	.384	
Q02	.366	.578	.372			
Q01		.487				
Q25		.453	.349		.437	
Q16	.433	.476	.744	.360	.441	.586
Q05		.504	.740	.452	.442	.434
Q04	.367	.484	.727	.430	.464	.356
Q14		.564	.680	.424	.461	.539
Q15	.372	.304	.674			.418
Q24	.468	.501	.572	.534	.513	.449
Q11			.427	.916	.402	.370
Q10			.361	.760		.311
Q23	.403	.313	.405		.770	.382
Q21	.551	.540	.606	.413	.685	.362
Q22		.443	.322		.567	
Q09				.397	.505	.326

### Structure Matrix

	Factor					
	1	2	3	4	5	6
Q13		.436	.575	.436	.496	.890
Q12			.499	.340	.428	.708
Q08	.397	.318	.448	.520	.448	.536

Extraction Method: Maximum Likelihood.

Rotation Method: Promax with Kaiser Normalization.

### Factor Correlation Matrix

Factor	1	2	3	4	5	6
1	1.000	.428	.507	.372	.454	.298
2	.428	1.000	.641	.384	.537	.372
3	.507	.641	1.000	.532	.583	.597
4	.372	.384	.532	1.000	.477	.446
5	.454	.537	.583	.477	1.000	.499
6	.298	.372	.597	.446	.499	1.000

Extraction Method: Maximum Likelihood.

Rotation Method: Promax with Kaiser Normalization.

### Reliability

Scale: F1

#### Case Processing Summary

		N	%
Cases	Valid	211	100.0
	Excluded <sup>a</sup>	0	.0
	Total	211	100.0

a. Listwise deletion based on all variables in the procedure.

#### Reliability Statistics

Cronbach's Alpha	N of Items
.850	4

#### Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Q07	10.645	5.364	.620	.841
Q17	10.227	5.881	.653	.827
Q18	10.512	5.099	.729	.793
Q19	10.659	4.950	.771	.774

## Reliability

		Notes	20-OCT-2016 10:33:34
Output Created			
Comments			
Input	Data	C:\DELL E4310 Laptop\@LaCie\Research\Research PostGraduate\MTech\CPU T\2015 & 2016\MansellIngrid\SharePoint Data - missings replaced_C_C.sav	
	Active Dataset	DataSet2	
	Filter	<none>	
	Weight	<none>	
	Split File	<none>	
	N of Rows in Working Data File		211
	Matrix Input		
Missing Value Handling	Definition of Missing	User-defined missing values are treated as missing.	
	Cases Used	Statistics are based on all cases with valid data for all variables in the procedure.	
Syntax		RELIABILITY /VARIABLES=Q05 Q04 Q14 Q15 Q16 /SCALE('F2') ALL /MODEL=ALPHA /SUMMARY=TOTAL.	
Resources	Processor Time		00:00:00.02
	Elapsed Time		00:00:00.01

## Scale: F2

### Case Processing Summary

		N	%
Cases	Valid	211	100.0
	Excluded <sup>a</sup>	0	.0
	Total	211	100.0

a. Listwise deletion based on all variables in the procedure.

### Reliability Statistics

Cronbach's Alpha	N of Items
.832	5



### Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Q05	13.872	6.141	.683	.783
Q04	13.668	6.375	.637	.797
Q14	13.744	6.487	.621	.801
Q15	13.668	6.804	.574	.814
Q16	13.768	7.017	.656	.796

### Reliability

		Notes	20-OCT-2016 10:33:34
Output Created			
Comments			
Input	Data	C:\DELL E4310 Laptop\@LaCie\Research\Research PostGraduate\MTech\CPU T\2015 & 2016\MansellIngrid\SharePoint Data - missings replaced_C_C.sav	
	Active Dataset	DataSet2	
	Filter	<none>	
	Weight	<none>	
	Split File	<none>	
	N of Rows in Working Data File		211
	Matrix Input		
Missing Value Handling	Definition of Missing	User-defined missing values are treated as missing.	
	Cases Used	Statistics are based on all cases with valid data for all variables in the procedure.	
Syntax		RELIABILITY /VARIABLES=Q01 Q02 Q03 Q06 Q20 Q25 /SCALE('F3') ALL /MODEL=ALPHA /SUMMARY=TOTAL.	
Resources	Processor Time		00:00:00.02
	Elapsed Time		00:00:00.02

### Scale: F3

#### Case Processing Summary

		N	%
Cases	Valid	211	100.0
	Excluded <sup>a</sup>	0	.0
	Total	211	100.0

a. Listwise deletion based on all variables in the procedure.

**Reliability Statistics**

Cronbach's Alpha	N of Items
.745	6

**Item-Total Statistics**

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Q01	18.3934	7.106	.372	.737
Q02	18.9573	6.517	.498	.704
Q03	19.0427	6.384	.537	.693
Q06	18.6730	6.393	.604	.676
Q20	19.0095	6.600	.541	.694
Q25	19.0047	6.538	.378	.744

**Reliability****Scale: F4****Case Processing Summary**

		N	%
Cases	Valid	211	100.0
	Excluded <sup>a</sup>	0	.0
	Total	211	100.0

a. Listwise deletion based on all variables in the procedure.

**Reliability Statistics**

Cronbach's Alpha	N of Items
.824	2

**Item-Total Statistics**

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Q10	3.109	.517	.700	.
Q11	3.028	.494	.700	.

**Reliability****Scale: F5****Case Processing Summary**

		N	%
Cases	Valid	211	100.0
	Excluded <sup>a</sup>	0	.0
	Total	211	100.0

a. Listwise deletion based on all variables in the procedure.

### Reliability Statistics

Cronbach's Alpha	N of Items
.712	4

### Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Q09	10.332	4.394	.421	.701
Q21	9.896	4.484	.546	.624
Q22	9.531	4.898	.458	.675
Q23	10.081	3.751	.594	.586

### Reliability

Scale: F6

### Case Processing Summary

	N	%	
Cases	Valid	211	100.0
	Excluded <sup>a</sup>	0	.0
	Total	211	100.0

a. Listwise deletion based on all variables in the procedure.

### Reliability Statistics

Cronbach's Alpha	N of Items
.747	3

### Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Q08	6.573	3.122	.481	.761
Q12	6.256	2.153	.601	.652
Q13	6.232	2.770	.680	.560

### Descriptives

### Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
F1	211	1.53	5.21	3.6879	.73800
F2	211	1.55	4.14	2.8890	.46433
F3	211	1.88	4.47	3.3305	.44262
F4	211	1.10	4.87	3.0397	.63388
F5	211	1.76	5.16	3.7260	.60297
F6	211	1.47	4.94	3.2847	.64613
Valid N (listwise)	211				