KNOWLEDGE TRANSFER FROM UNIVERSITY TO INDUSTRY

A Dissertation

by

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To be submitted in fulfillment of the requirements for the degree

MASTER OF TECHNOLOGIAE: QUALITY

In the

Faculty of Engineering

CAPE PENINSULA UNIVERSITY OF TECHNOLOGY

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Cape Town

November 2011

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Elvina Raquel Janine Moosa

Signature:

Date: November 2011

DEDICATION

This study is dedicated to my children, Shane, Kelly and Hayley for their unconditional love, support and encouragement.

ACKNOWLEDGEMENTS

I would like to express my sincere gratitude and appreciation to the following people for their contribution:

- Prof. Andre Watkins for his support, motivation, encouragement and guidance.
- My children, Shane, Kelly and Hayley for their unconditional love. Thank you for your patience and for always being there for me.
- My parents, Veronica Magardie and Sydney and Maggie Jonathan, for their love, encouragement and support.
- Andre Bester for his invaluable support and motivation.
- Dave Joubert whose encouragement and motivation kept me focussed.
- Dave Evans for his assistance and advice.
- Walter Kohlhofer for being a good friend and motivator.
- Prof. Ed Snyders for his invaluable support and encouragement.
- My friends and colleagues at the Cape Peninsula University of Technology for their support.

TABLE OF CONTENTS

CHAPTER 1: SCOPE OF THE RESEARCH 1

1.1 INTRODUCTION AND BACKGROUND 1
1.2 RESEARCH PROCESS 2
1.3 BACKGROUND TO THE RESEARCH PROBLEM 3
1.4 RESEARCH PROBLEM STATEMENT 4
1.5 RESEARCH QUESTION 4
1.5.1 Investigative Questions 4
1.6 RESEARCH DESIGN AND METHODOLOGY 5
1.6.1 The survey design and methodology 7
1.7 RESEARCH ASSUMPTIONS 7
1.8 RESEARCH CONSTRAINTS 8
1.8.1 Limitations 8
1.8.2 Delimitations 9
1.9 CHAPTER AND CONTENT ANALYSIS 9
1.10 KEY RESEARCH OBJECTIVES 10
1.11 SIGNIFICANCE OF THE PROPOSED RESEARCH 10
1.12 ETHICAL CONSIDERATIONS 10

CHAPTER 2: A HOLISTIC PERSPECTIVE OF THE RESEARCH ENVIRONMENT 13

2.1 INTRODUCTION 13
2.2 FACTORS THAT INFLUENCE THE TRANSFER OF KNOWLEDGE ... 13
2.2.1 Inability to determine the needs of industry 14
2.2.2 Lack of involvement in industry 16
2.2.3 Lack of social responsibility 17
2.2.4 Lack of sharing of knowledge and expertise 18
2.2.5 Misconception of knowledge transfer 19
2.3 UNIVERSITY – INDUSTRY COLLABORATION 20
2.4 WORK INTEGRATED LEARNING / PLACEMENT OF STUDENTS 22
2.5 CONCLUSION 22

CHAPTER 3: KNOWLEDGE TRANSFER FROM UNIVERSITY TO INDUSTRY: A LITERATURE REVIEW

3.1 INTRODUCTION 23
3.2 KNOWLEDGE TRANSFER CHANNELS 25
3.3 TRANSFERRING EXPLICIT AND TACIT KNOWLEDGE 26

3.4 KNOWLEDGE AT UNIVERSITY AND THE TRANSFER TO INDUSTRY 30
3.5 KNOWLEDGE REQUIRED BY INDUSTRY 32
3.6 KNOWLEDGE TRANSFER – BENEFITS OF QUALITY TOOLS AND TECHNIQUES 34
3.7 KNOWLEDGE MANAGEMENT ENABLERS 35
3.8 KNOWLEDGE MANAGEMENT BARRIERS 37
3.9 KNOWLEDGE CREATION AND SHARING 39

CHAPTER 4: RESEARCH DESIGN AND METHODOLOGY 42

4.1 AIM OF THIS CHAPTER 42
4.2 THE SURVEY ENVIRONMENT 42
4.3 THE TARGET POPULATION 42
4.4 MEASUREMENT SCALES 43
4.5 SURVEY DESIGN 43
4.6 DATA VALIDITY AND RELIABILITY 45
4.7 CONCLUSION 46

CHAPTER 5: DATA ANALYSIS AND INTERPRETATION 47

5.1 INTRODUCTION 47
5.2 METHOD OF ANALYSIS 48
5.2.1 Validation of Survey results 48
5.2.2 Data format 48
5.2.3 Preliminary analysis 49
5.2.4 Inferential statistics 49
5.2.5 Assistance to Researcher 50
5.2.6 Sample 51
5.3 ANALYSIS 51
5.3.1 Reliability testing 53
5.3.2 Descriptive Statistics 57
5.3.3 Uni-Variate Graphs 58
5.3.3.2 Industry survey 61
5.3.4 Inferential Statistics 63

CHAPTER 6: CONCLUSION AND RECOMMENDATIONS 71

6.1 THE RESEARCH THUS FAR 71
6.2 ANALOGIES DRAWN FROM THE DATA ANALYSIS 71
6.3 ANALOGIES DRAWN FROM THE LITERATURE REVIEW 73
6.3.1 Transfer from University to Industry 73
6.3.2 Knowledge required by industry 74
6.3.3 Channels of transfer 75

6.4 THE RESEARCH PROBLEM REVISITED 75
6.5 THE RESEARCH QUESTION REVISITED 76
6.5.1 Advisory Board 76
6.5.2 Sharing of knowledge and expertise 77
6.5.3 Misconception of knowledge transfer 78
6.6 KEY RESEARCH OBJECTIVES REVISITED 78
6.6.1 To determine the demands from industry in respect of knowledge .transfer from graduate students. 79
6.6.2 To determine the shortcomings at tertiary institutions in respect of knowledge transfer to students, and thereafter to industry. 79
6.6.3 To determine which elements are critical for successful knowledge transfer. 79
6.6.4 To formulate an approach for industry to close the gap created by the demands of the knowledge gap 80
6.6.5 To ascertain whether a structured mechanism can be implemented by tertiary institutions to narrow the gap between University knowledge and industry requirements? 80
6.7 FINAL CONCLUSION 81

BIBLIOGRAPHY 82

LIST OF TABLES

Table 3.1:	Definition of operational variables ……………………………..…..	36
Table 4.1:	Sample questionnaire for industry………………………………..	44
Table 4.2:	Sample questionnaire for staff………..……………………..……	45
Table 5.1:	Adaption of staff questionnaire numbering…………………...….	45
Table 5.4:	Cronbach's Alpha Coefficient for each scale forming the measurement of knowledge gap between tertiary institutions and industry……………………………………………………...……	54
Table 5.6:	Cronbach's Alpha Coefficient for each scale forming the measurement industry demands………………………………..	55
Table 5.7:	Cronbach's Alpha Coefficient for each scale forming the measurement of the key elements…………………………...……	56
Table 5.8:	Cronbach's Alpha Coefficient for each scale forming the measurement of the knowledge gap……………………….….….	56
Table 5.13:	Statistically significant Chi-square test for equal proportions for industry survey…………………………………………..…….	64
Table 5.14:	Statistically significant Chi-square test for equal proportions between the staff and the industry……………………..…...…	66
Table 5.15:	Contingency table for Q8n versus the survey groups…..………..	68
Table 5.16:	Contingency table for Q17n versus the survey groups…..………	68
Table 5.17:	Contingency table for Q20n versus the survey groups…..………	68
Table 5.18:	Wilcoxon Scores (Rank Sums) for the SLA………………..……	69

LIST OF FIGURES

Figure 2.1:	Relation between Core business and Quality……………...……	15
Figure 2.2:	Linkages between University and industry……….......……..…	17
Figure 2.3:	Sharing knowledge and expertise…………….....…...…………	19
Figure 2.4:	Resource activities at University and industry…..…......……….	21
Figure 3.1:	Process of generating information/knowledge in the market.…..	26
Figure 3.2:	Modes of the Knowledge Creation ……….…………….....…...	28
Figure 3.3:	Knowledge created through a spiral…….……….…...…..…….	40
Figure 5.1:	Survey distribution……………...………………….....….……	58
Figure 5.2:	Critical shortcomings……..……………………….....….…….	59
Figure 5.3:	Key elements………………..…………………..……....……	59
Figure 5.4:	Knowledge gap………………….………………......…..…..…	60
Figure 5.5:	Industry demands………………….……………......…..…….	61
Figure 5.6:	Critical shortcomings……………………..…..………......……	61
Figure 5.7:	Key elements……………………………………….….…...…	62
Figure 5.8:	Critical shortcomings…………………………….….…...……	63
Figure 5.9:	The University has regular contact sessions with students in the industry……………………………………….………….....	67
Figure 5.10:	Industry is involved in curriculum reviews………………...……	68
Figure 5.11:	Employees create an opportunity for students to apply their knowledge……………………………………..……...….	69
Figure 5.12:	Critical shortcomings……………..………………...…………	70

LIST OF ANNEXURES

Annexure A:	Questionnaire: Industry…………………………………………..…..	86
Annexure B:	Questionnaire: Staff……………………………………….....…..	88
Annexure C:	Table 5.2: Cronbach's Alpha Coefficient for all the items forming the measuring instrument in the staff sample……..…...	89
Annexure D:	Table 5.3: Cronbach's Alpha Coefficient for all the items forming the measuring instrument in the staff sample deleting Q1 from the sample………………………………………….….	91
Annexure E:	Table 5.5: Cronbach's Alpha Coefficient for each scale forming the measurement of the industry sample………………………..	93
Annexure F:	Table 5.9: Descriptive statistics for all the variables of the staff questionnaire …………………..………………………….…..…	95
Annexure G:	Table 5.10: Descriptive statistics for all the variables of the industry questionnaire………………………….…...……….	98
Annexure H:	Table 5.11: Descriptive statistics for staff questionnaire – Mean, Median, Standard Deviation and Range……….……..….	102
Annexure I:	Table 5.12: Descriptive statistics for industry questionnaire – Mean, Median, Standard Deviation and Range………………....	104
Annexure J:	Cronbach Alpha Coefficients for the items in the staff questionnaire………...………………………………………..	107
Annexure K:	Cronbach Alpha Coefficients for the items in the industry questionnaire……………………………………………...…..	110
Annexure L:	Descriptive statistics: Frequency tables for staff questionnaire ..	114
Annexure M:	Descriptive statistics: Frequency tables for staff questionnaire...	118
Annexure N:	Descriptive statistics for staff questionnaire: Uni-variate with means & standard deviations where appropriate…………….….....	123
Annexure O:	Descriptive statistics for industryquestionnaire: Uni-variate with means & standard deviations where appropriate…………..	129
Annexure P:	Comparison of proportions for staff questionnaire………...……	138
Annexure Q:	Comparison of proportions for industry questionnaire………….	141
Annexure R:	Chi-square for comparisons…………………..…………………	144
Annexure S:	ANOVA & Man Whitney test…………………………………..	153

ABSTRACT

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Degree: Magister Technologiae: Quality

Title: Knowledge transfer from University to Industry

University: Cape Peninsula University of Technology

Faculty: Faculty of Engineering

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Date: October 2011

Key words: knowledge transfer, tacit knowledge, explicit knowledge, quality tools and techniques, partnership, social responsibility.

Knowledge transfer is considered to distribute knowledge and to ensure that it is used in future. At University level, the transfer of knowledge to students is the core function, and the effectiveness is therefore critical. To identify ways to manage and transfer knowledge is a challenge for the University and industry. The demands from industry are not necessarily communicated to the University, and therefore a gap could occur.

It is difficult to determine the need for quality practices in industry and the gap could, in some instances, be blamed on improper knowledge transfer at University level. The lack of knowledge transferred between students and their employers is also possible. Students could, for various reasons, find it difficult to apply their knowledge.

Knowledge transfer is diverse and the knowledge transferred between University and industry could be done through different channels. Understanding how the knowledge transfer processes impacts on the University's ability to focus on requirements by industry is sometimes ambiguous.

As knowledge expands, the application thereof could also be difficult to achieve in industry. The competencies and resources at the University should be put to optimal use in order to assist with the transition from University to industry, and to assist with the application of knowledge in industry. There must be synergy between the two entities. The gap could be narrowed when there is active involvement from industry and full cooperation from the University.

CHAPTER 1: SCOPE OF THE RESEARCH

1.1 INTRODUCTION AND BACKGROUND

The transfer of knowledge at university level is experienced in diverse ways, by individuals. The challenges increase every year when new students enroll at the university. What students have learned is not necessarily transferred to the workplace. It is to the advantage of any organisation to continuously improve its processes, and to embark on quality improvement and assurance processes. It is therefore imperative that students apply their knowledge in industry. It is important, in order to support the organisation, to operate at the highest potential. The needs or knowledge required by industry are not comprehensible, or are not properly communicated to the University.

The corporate world is becoming more competitive. Organisations compete globally, and the need for delivering quality service is increasing. Quality features in everything we do, hence the great demand from students to study Quality. Organisations also “invest” in quality and pay for their employees to study Quality. Every year a number of students complete their BTech degrees in Quality. Students do research projects, but it is not clear if graduates apply their knowledge, or how they apply it, after completing their studies. It is therefore important that the transfer of knowledge, or the lack thereof, is highlighted in an attempt to bridge the gap between the University and industry.

The challenges that hamper students from transferring and applying their knowledge in organizations, could include internal organizational challenges, as well as students’ own lack of understanding, initiative or interest. Learning, for instance, about quality tools and techniques is very different to applying the tools and techniques and understanding how and when to use the tools. The transition may not be clear, which could also be the cause of the lack of implementation by students. It is also possible that the transfer of knowledge at university level is not satisfactory and does not address the practical issues experienced in industry.

Commitment from top management is absolutely crucial for the successful implementation of sharing information and transferring knowledge. Training of staff is imperative. Staff needs to be aware of the advantages of sharing information and how it could be used to improve productivity and enhance overall performance. More and more businesses realize that, in order to stay competitive, they have to improve on quality, but sometimes mass production takes precedence and the implementation and monitoring of quality can easily take a backseat. Although organisations are also expected to attain some form of quality certification, it still does not mean that continuous quality improvement takes place after certification. To determine where the problem lies in the organisations, research has to be done in order to focus on the application of knowledge in industry and whether the knowledge transferred at University level is adequate.

The aim of this study is to determine, and narrow, the gap between knowledge at University and knowledge required by industry. This should encourage continuous liaisons and relationships with industry. A good relationship between the University and industry could ensure successful knowledge transfer, which could benefit both entities.

1.2 RESEARCH PROCESS

Remenyi, Williams, Money and Swartz as cited by Watkins (2010:39), explain the research process as consisting of eight specific phases, namely:

- Reviewing the literature.
- Formalising a research question.
- Establishing the methodology.
- Collecting evidence.
- Analysing the evidence.
- Developing conclusions.
- Understanding the limitations of the research.
- Producing management guidelines or recommendations.

According to Collis and Hussey as cited by Watkins (2010:40) there are six fundamental stages in the research process, namely:

- Identification of the research topic.
- Definition of the research problem.
- Determining how the research is going to be conducted.
- Collection of the research data.
- Analysis and interpretation of the research data.
- Writing up of the dissertation or thesis.

The following process will be followed in this research study:

- Identification of the research topic.
- Reviewing the literature.
- Formalising a research question.
- Establishing the methodology.
- Determining how the research is going to be conducted.
- Collecting the evidence.
- Analysing the evidence.
- Developing conclusions.

1.3 BACKGROUND TO THE RESEARCH PROBLEM

The effectiveness of a programme, and the way students transfer their knowledge in industry, is difficult to assess and quantify. It is important that knowledge transfer and the application thereof is determined to evaluate effectiveness of programmes and the impact they have on industry. A study, where these problems are examined, could assist the University and industry to improve performances by extensively using and channeling information.

The challenges hampering students from transferring and applying their knowledge in organisations could be internal, in the organization, or it could be the students' lack of understanding, initiative or interest. It is also possible that the transfer of knowledge at university level is not adequate, and does not address practical issues experienced in industry. It is therefore critical that the factors that cause the gap between knowledge at University and knowledge required by industry are determined.

1.4 RESEARCH PROBLEM STATEMENT

Against the above background to the research problem, the research problem statement reads as follows: "Academic knowledge gleaned at University does not meet the requirements of industry"

1.5 RESEARCH QUESTION

Forming the crux of this dissertation, the following question will be researched: "What mechanism can be implemented by Universities to narrow the gap between University knowledge and industry requirements?"

1.5.1 Investigative Questions

The investigative questions to be researched in support of the research question are the following:

- What are the particular demands from industry with respect to knowledge transfer from graduate students?
- What are the critical shortcomings at University with respect to knowledge transfer to students, and thereafter to industry?
- What are the key elements which are critical for successful knowledge transfer?
- What remedial actions should industry implement to meet the demands created by the knowledge gap between Universities and industry?

1.6 RESEARCH DESIGN AND METHODOLOGY

Case study research will form the primary research method for this study. Primarily falling within the phenomenological (qualitative) paradigm, case study research can equally be applied within the context of the positivistic (quantitative) paradigm. According to Yin, cited by Watkins (2010:42), a research design can be defined as, "…the logical sequence that connects the empirical data to a study's initial research question, and ultimately, to its conclusions. Colloquially, a research design *is an action plan from getting from here to there*, where *here* may be defined as the initial set of questions to be answered, and *there* is some set of conclusions (answers) about these questions". Some of the more salient aspects of case study research, described by Yin, are listed below for ease of reference:

- ➢ A case study is an empirical enquiry that investigates a contemporary phenomenon within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident.
- ➢ Case study research aims not only to explore certain phenomena, but also to understand them in particular context.
- ➢ 'How' and 'why' questions are explanatory, and likely to be used in case study research.
- ➢ A case study illuminates a decision or set of decisions – why they were taken, how they were implemented, and with what results.
- ➢ The case study as a research strategy comprises an all-encompassing method – with the logic of design incorporating specific approaches to data collection and data analysis. In this sense, the case study is neither a data collection tactic nor merely a design feature alone, but á comprehensive research strategy'.
- ➢ Case study research uses multiple methods for collecting data, which may be both qualitative and quantitative.
- ➢ A case study is typically used when contextual conditions are the subject of research.

According to Collis and Hussey as cited by Watkins (2010:47), case studies are often described as exploratory research used in areas where there are few theories, or a deficient body of knowledge. In addition, the following types of case studies can be identified:

- **Descriptive case studies:** Where the objective is restricted to describing current practice.
- **Illustrative case studies:** Where the research attempts to illustrate new and possibly innovative practices adopted by particular companies.
- **Experimental case studies:** Where the research examines the difficulties in implementing new procedures and techniques in an organization and evaluates the benefits.
- **Explanatory case studies:** Where existing theory is used to understand and explain what is happening.

Yin as cited by Watkins (2010:47), emphasizes the following five components of a research design, which are especially important for case studies:

- **Study questions:** The case study is most likely to be appropriate for ‘how’ and ‘why’ questions, which call for the initial task being to clarify precisely the nature of the study questions.
- **Study propositions:** A study proposition directs the attention to something that should be examined within the scope of the study. For greater clarity, the proposition points to ‘the reason for the study’.
- **Unit of analysis:** Should the case study involve a specific person being studied, say a person representing a specific diversity case, the individual being studied is the primary unit of analysis. The tentative definition of the unit of analysis is related to the way in which the initial research questions were formulated.
- **Linking data to propositions:** A number of ways are open to students to link data to propositions. An approach suggested by Yin is that of ‘pattern matching’, whereby several pieces of information from the same case may be related to some theoretical proposition.

- **Criteria for interpreting findings:** If the different 'patterns' are sufficiently contrasting, the findings can be interpreted in terms of comparing at least two rival propositions.

1.6.1 The survey design and methodology

The survey design and methodology is elaborated upon, within the ambit of Chapter 4. Primary data will be collected via two sources, namely: (Only one source appears to be quoted below.)

- **A survey using questionnaires:** The concept 'survey' is defined by Remenyi *et al* as cited by Watkins (2010:67), as "…the collection of a large quantity of evidence, usually numeric, or evidence that will be converted to numbers, normally by means of a questionnaire". A questionnaire is a list of carefully structured questions, chosen after considerable testing, with a view to eliciting reliable responses from a chosen sample. The aim is to establish what a selected group of participants do, think or feel. A positivistic approach suggests structured 'closed' questions, while a phenomenological approach suggests unstructured 'open-ended' questions.

1.7 RESEARCH ASSUMPTIONS

Leedy and Ormrod as cited by Watkins (2010:72), provide the following explanation of assumptions which could not be improved upon, and are thus cited verbatim: "Assumptions are what the researcher takes for granted. But taking things for granted may cause much misunderstanding. What we may tacitly assume, others may have never considered. If we act on our assumptions, and if in the final result which actions make a big difference in the outcome, we may face a situation we are totally unprepared to accept. In research we try to leave nothing to chance in the hope of preventing any misunderstanding. All assumptions that have a material bearing on the problem should be openly and unreservedly set forth. If others know the assumptions a researcher makes, they are better prepared to evaluate the conclusions that result from such assumptions.”

- Knowledge transfer is used to form links between the University and industry.
- Organisations that are involved in the research will be actively involved in monitoring knowledge transfer.
- Organisations are honest when information regarding their activities is disseminated.
- Information gathered during the investigation will assist in improving performance in both the University and industry.

1.8 RESEARCH CONSTRAINTS

According to Collis and Hussey as cited by Watkins (2010:73), ‘limitations’ identify weaknesses in the research, while ‘de-limitations’ explain how the scope of the study was focused on only one particular area or entity, as opposed to, say, a wider or (more) holistic approach. The authors provide the following examples of the two concepts:

- **Limitations:** Upon completion of an investigation, one may consider that it is appropriate to generalize from the research findings, because of the way in which one has structured the sample.
- **De-limitations:** One may elect to confine interviews to employees in only one company, or restrict the postal questionnaire to one specific geographical area.

1.8.1 Limitations

The following limitations may occur:

- Availability of Managers and staff.
- Organisations may not want to take part in the study.
- Some companies in industry may not want to give information because it can reflect on negative functions and practices in the organisation.
- Staff may be reluctant to be interviewed.

1.8.2 Delimitations

The scope of the research will be limited to a survey done in the Department of Industrial and Systems Engineering (DISE) at the Cape Peninsula University of Technology (CPUT), and companies in the Industrial Engineering industry.

1.9 CHAPTER AND CONTENT ANALYSIS

Chapter 1 – Scope of the research: In this chapter a holistic perspective will be provided in the ambit of this dissertation.

Chapter 2 – Background to the research problem: A holistic perspective: In this chapter a holistic view will be provided on the transfer of knowledge from University to industry.

Chapter 3 – Literature Review: In this chapter, a literature review will be conducted on the following aspects:

- Introduction
- Knowledge transfer channels
- Transferring explicit and tacit knowledge
- Knowledge at University and the transfer to industry
- Knowledge required by industry
- Knowledge transfer: benefits of quality tools and techniques
- Knowledge management enablers
- Knowledge management barriers
- Knowledge creation and sharing

Chapter 4 – Survey Design and Methodology: In this chapter, the survey design and methodology within the ambit of this dissertation will be elaborated upon in detail.

Chapter 5 - Data Analysis and interpretation of survey results: In this chapter, data gleaned from the research survey conducted within the ambit of Chapter 4 will be analysed and interpreted.

Chapter 6 - Conclusion and Recommendations: In this chapter, the research will be concluded. Key elements raised in chapter 1 will be revisited and recommendations made to, not only mitigate the research problem, but also to provide an answer to the research questions and associated investigative questions.

1.10 KEY RESEARCH OBJECTIVES

The key research objectives in this research study are:

- To determine the demands from industry with respect to knowledge transfer from graduate students.
- To determine the shortcomings at University in respect of knowledge transfer to students and thereafter to industry.
- To determine which elements are critical for successful knowledge transfer.
- To formulate an approach for industry to close the gap created by the demands of the knowledge gap
- To ascertain whether a structured mechanism can be implemented by the University to narrow the gap between University knowledge and industry requirements?

1.11 SIGNIFICANCE OF THE PROPOSED RESEARCH

The significance of this research lies in determining the gap between knowledge at University and knowledge required by industry. Determining the gap will provide the University with the necessary information to focus on specific knowledge required by industry and to narrow the gap. It could also improve relationships and liaisons with industry.

1.12 ETHICAL CONSIDERATIONS

In the context of research, according to Saunders, Lewis and Thornhill as cited by Watkins (2010:69), "…*ethics* refers to the appropriateness of your behaviour in relation to the rights of those who become the subject of your work, or are affected by it". Most ethical issues in research fall into one of four categories namely, protection from harm, informed consent, right to privacy, and honesty with professional colleagues (Leedy & Ormrod, by Watkins 2010:69):

- **Protection from harm:** In cases where the nature of a study involves creating a small amount of psychological discomfort, participants should know about it ahead of time, and any necessary debriefing or counseling should follow immediately after their participation.
- **Informed consent:** Participants should be told in advance about the nature of the study to be conducted, and be given the choice of either participating or not participating. Furthermore, they should be given the right to withdraw from the study at any time, as participation in a study should be strictly voluntary. An informed consent form that describes the nature of research as well as the nature of the required participation will be presented to participants of this research study. Such a form should, according to Leedy and Ormrod as cited by Watkins (2010:69), contain the following information:
    - A brief description of the nature of the study.
    - A description of what participation will involve in terms of activities and duration.
    - A statement indicating that participation is voluntary and can be terminated at any time, without penalty.
    - A list of potential risks and/or discomfort that participants may encounter.
    - The guarantee that all responses will remain confidential and anonymous.
    - The researcher's name, plus information about how the researcher can be contacted.
    - An individual, or office, that participants can contact, should they have questions or concerns about the study.
    - An offer to provide detailed information about the study (e.g., a summary of findings) upon its completion.
    - A place for participants to sign and date the consent form, indicating agreement to participate.

- **Right to privacy:** Any research study should respect participants' right to privacy. In general, a researcher must keep the nature and quality of participants' performance strictly confidential.
- **Honesty with professional colleagues:** Researchers must report their findings in a complete and honest fashion, without misrepresenting what they have done, or intentionally misleading others as to the nature of their findings. Under no circumstances should a researcher fabricate data to support a particular conclusion, no matter how seemingly 'noble' (desirable?) that conclusion may be.

CHAPTER 2: A HOLISTIC PERSPECTIVE OF THE RESEARCH ENVIRONMENT

2.1 INTRODUCTION

Knowledge transfer is intended to distribute knowledge and to ensure that it is used in future. At University level, the transfer of knowledge to students is the core function, and the effectiveness is therefore critical. Measuring the effectiveness of knowledge transfer at University is not an easy task. Furthermore, the knowledge required by industry also needs to be determined. Defining and understanding the scope of knowledge required in industry is imperative because of the varied needs and demands in industry.

To identify ways to manage and transfer knowledge is a challenge for both the University and industry. The demands from industry are not necessarily communicated to the University and therefore a gap could occur. Quality Management is used in industry, but the application and the extent of the application should be analysed. What some organizations in industry deem important for improving quality management, others may consider insignificant, and may not use as part of their quality management strategies. The challenge, therefore, increases because the University needs to ensure that, whatever is expected from industry, the knowledge shared is functional.

2.2 FACTORS THAT INFLUENCE THE TRANSFER OF KNOWLEDGE

Some factors that could influence the transfer of knowledge between University and industry include:

- The inability to determine the needs of industry
- The lack of involvement in industry
- The lack of social responsibility
- The lack of sharing of knowledge and expertise

- The misconception of knowledge transfer

The above factors are elaborated upon below, to provide the context of the research environment.

2.2.1 Inability to determine the needs of industry

A number of constraints could hamper the process of determining what is needed or required by industry. The current intake of students in the Quality department is on a full-time and part-time basis. The full-time students are generally the students who do not have permanent jobs and continue with their BTech degrees directly after completion of their National Diploma. Part-time students, generally, are students who are working, and a small percentage of them are working in a quality management environment. However, some students do not get any exposure to quality in industry. It could therefore be possible that students enroll for a degree in quality, for the following reasons:

- They have an interest in quality.
- They would like to pursue a career in quality.
- They would like to obtain a BTech degree.
- They could not find a job after completion of their National Diploma.
- They need hostel accommodation while searching for a job.
- They are sent by their employers to study quality.

Quality is very diverse, and there are different approaches to quality in different fields. With the intake of students from various industries, it is a rather daunting task to address each specific requirement. However, the basic principles are taught, that relate to quality management and the application thereof. It is important that the Department of Industrial and Systems Engineering investigates the specific needs in industry, in order to ensure that the knowledge which is transferred could be used in industry.

Students in other industries e.g. engineering, food technology, biomedical science etc. can apply their knowledge to their respective fields. They gain more knowledge, and become experts in their fields. Students who study Quality would, in many cases, start their working careers and never apply the knowledge gained at University. It becomes a qualification which is not used by the student, because of the student's undergraduate qualification in which he/she specializes. As discussed earlier, there could be various reasons why students study Quality.

As illustrated in figure 2.1 below, quality could be seen as an "extra" task in the workplace, and could therefore be neglected because it is not the core function of the organization.

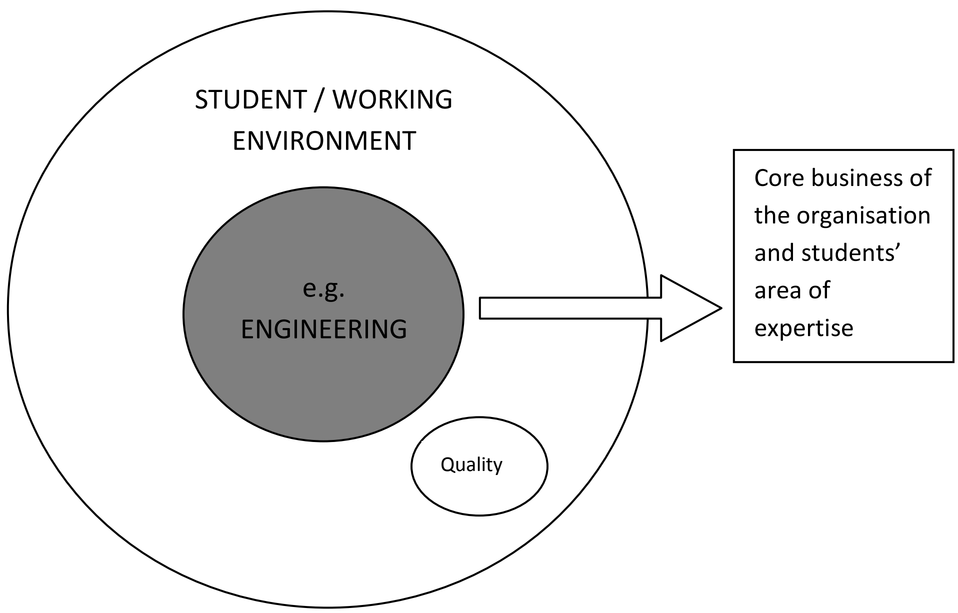


Figure 2.1: Relation between Core business and Quality (**Source**: Own)

The lack of knowledge transferred between students and their employers is also possible. Students could, for various reasons, find it difficult to apply their knowledge. These reasons could be:

- Lack of interest or initiative of students.
- Lack of ability. Students do not know how to apply their knowledge.
- Employers do not allow, or create an environment, for the student to apply his/her knowledge.

- Lack of management commitment.

It is therefore difficult to determine the need for quality practices in industry, and the gap could, in some instances, be blamed on improper knowledge transfer at University level.

2.2.2 Lack of involvement in industry

A requirement of the University is that each programme or department must have an Advisory Board. The Advisory Board consists of members from industry which, as a committee, meet every term or semester, depending on the need of the programme or department. The Advisory Board could assist in developing partnerships between the University and employers/industry. Their role is also to provide a platform for communication between the department and industry.

Although the guidelines and roles and responsibilities of the Advisory Board are clear, the extent to which they play an active part in assisting the department is (still) to be determined. Although meetings are held, other forms of interaction should also be investigated. The Quality programme does not place students in industry for work-integrated learning. Work-integrated learning is done at National Diploma level and is not a requirement for the BTech degree in Quality. Recruitment and placement of students require direct contact with industry. Lecturing staff, currently, do not have the time to form links with industry and to physically visit industry. Time constraints are a major concern and can, at this stage, not be addressed because of the workload of the lecturing staff. With this is mind, the Advisory Board’s role is becoming more important in assisting the department in the planning and implementation processes of various activities.

Important linkages between industry and the University consist of the following activities outlined in figure 2.2 below:

- Project development
- Placement of students

- Sharing of expertise
- Curriculum reviews
- Developing partnerships

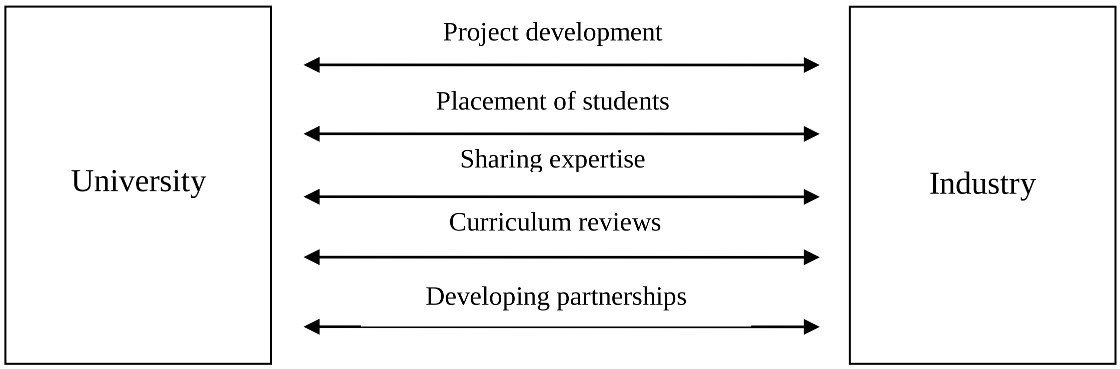


Figure 2.2: Linkages between University and industry (**Source**: Own)

Currently, the Advisory Board in the Department of Industrial and Systems Engineering is a combined Advisory Board for industrial engineering, as well as quality. The quality programme does not have its own Advisory Board which could raise some concerns. However, the current Advisory Board has members on the board who represent quality, and the advantage is that different industries could assist each other in forming collaborations and exchanging knowledge with the department as a whole.

An active Advisory Board is crucial to form links with industry. It is also important that regular reviews are held to discuss any changes in requirements from industry. Any changes in the curriculum at the University should be discussed with the Advisory Board in order to get input and guidance from industry.

2.2.3 Lack of social responsibility

In recent years, universities have become more involved in community engagement projects. Community engagement forms part of the University's strategic direction. The aim is to focus on the social development needs of staff and students. According to the Cape Peninsula University of Technology's strategic plan (2010), the aim is to enter mutually beneficial partnerships for development, the appropriation of knowledge and life-long learning.

Currently, there is no community engagement plan in the department. As previously discussed, the heavy workload of staff members makes it impossible to engage in social responsibility activities. Although social responsibility is important, it cannot be implemented because of the lack of time and other resources. The University and industry should combine forces to engage in projects in the community. Partnerships with industry would create more opportunities for social engagement and social responsibility, for staff and students.

2.2.4 Lack of sharing of knowledge and expertise

There could be a number of reasons why there is a lack of knowledge sharing at University, or between University and industry. Experts may not want to share their knowledge for fear of losing their positions, or fear that intellectual property may be compromised. Tacit knowledge is also very difficult to share, which could be a further cause for the lack of sharing of knowledge. New or junior staff could be seen as a threat to experienced staff which could also hamper the interaction process and the sharing of practices.

Sharing of expertise forms an integral part of the teaching process. Sharing could be between academics, academics and industry/stakeholders, as well as academics and students. Expertise shared could be shared by arranging guest speakers from industry or guest lecturers, or researchers from other universities. However, there are financial constraints that restrict the regular visits of guests. Videoconferencing is another aspect of sharing of expertise, which should be explored by the department/University. This could not only lower costs but could enhance the sharing of expertise through communication.

In any organization, people possess knowledge and expertise. At University and industry level, different expertise is required, but it is extremely important that expertise is shared, for further development at the University and in industry. An exchange programme between industry and the University would be ideal for sharing expertise. In some Faculties the exchange between University and industry has worked very well. In the Department of Industrial and Systems Engineering this practice has not been followed. It is a possibility that should be explored. This would give academics direct access to industry, which would give them first hand information of the needs and demands in industry. In return, industry would learn about the gaps in knowledge transferred at University, and could guide the department in determining the needs of industry to equip and prepare students for the workplace. Figure 2.3 illustrates the knowledge sharing process.

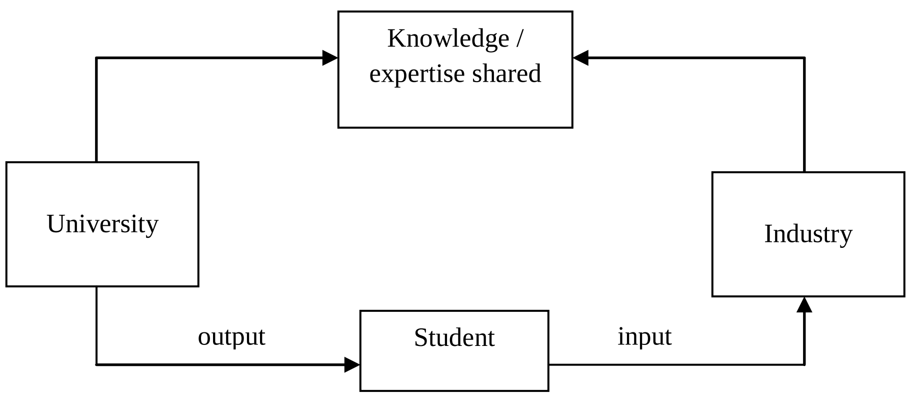


Figure 2.3: Sharing knowledge and expertise (**Source**: Own)

2.2.5 Misconception of knowledge transfer

Knowledge transfer could be perceived as knowledge transferred only from lecturer to student. In the academic arena, knowledge could be transferred in a number of ways. Besides the transfer of knowledge in the classroom, the publication of journals and attendance at workshops and conferences are important transfer channels that contribute to the knowledge transferred at University. Communication, in any form, is critical in academic departments, because sharing information and practices is part of the knowledge transfer process. Communication is also important to eliminate the misconception of knowledge transfer by individuals. Academic staff also needs to be informed of industry requirements, and to keep them involved in the development of linkages and collaborations.

Knowledge transfer is diverse, and the knowledge transferred between University and industry could be done through various channels. Understanding how the knowledge transfer processes impact on the University's ability to focus on requirements by industry is sometimes ambiguous. Finding the gap between knowledge at University and knowledge required by industry is therefore important, to continuously improve and to update the relevant content of courses.

Industry could also perceive knowledge transfer as being knowledge transferred at University level only. This misconception could prevent them from collaborating with the University or serving on the Advisory Board. The University needs to be actively involved in partnering with industry, and to inform them of the importance of the role they play in the knowledge transfer process. In turn, the department needs to identify the organisations in industry, which could be approached for possible collaboration.

A distinction between tacit and explicit knowledge also need to be made in order to understand what type of knowledge is referred to when communication between University and industry takes place. Explicit knowledge, which is knowledge that is easily communicable, is commonly used when people share practices and knowledge. Students would therefore generally use explicit knowledge when employed in industry after graduation. Tacit knowledge is difficult to communicate, as it acquires expertise and skill which is acquired over time.

2.3 UNIVERSITY – INDUSTRY COLLABORATION

University – industry collaboration has definitely become the focal point at the University. The importance of this collaboration is becoming more evident, and the intensity cannot be ignored. There should be a link between certain activities at

University level and industry level. In order to determine the gap between knowledge at University and knowledge required by industry, the link must be active and monitored by both parties. The link could be in the form of advisory boards, industry-academic exchange programmes, research projects, work integrated learning etc. The department should determine which linkages they want to focus on, which could benefit the department, students and industry.

University - industry collaboration could also secure funding for research from which both entities could benefit. Research areas could focus on specific projects determined by industry, which could also form part of social responsibility and development. Work-integrated learning, or placement of graduates, could also be explored through collaboration.

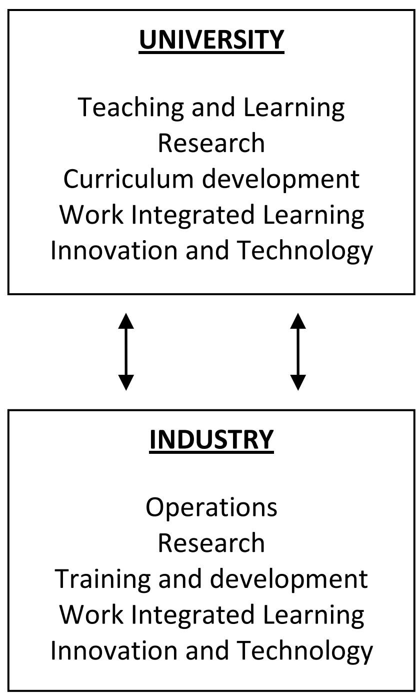


Figure 2.4: Resource activities at University and industry (**Source**: Own)

As knowledge expands, the application thereof could also be difficult to achieve in industry. The competencies and resources at the University should be put to optimal use in order to assist with the transition from University to industry, and to assist with the application of knowledge in industry. There must be synergy between the two entities. The gap could be narrowed when there is active involvement from industry and full co-operation from the University.

2.4 WORK INTEGRATED LEARNING / PLACEMENT OF STUDENTS

As previously mentioned, the Quality programme does require work integrated learning because it is BTech degree programme. Although Work Integrated Learning is not a requirement, placing students in industry should be explored. It could provide job opportunities for students, and monitoring students that are in industry could benefit the programme and department in order to determine what skills students apply in industry and what knowledge is required by industry.

Time constraint is a major problem in the department because lecturing staff has a big workload and they cannot focus on monitoring students. Besides the advantages that placing and monitoring students in industry have, it could also provide the department with academic standing in industry, which could generate funding and research opportunities.

2.5 CONCLUSION

In this chapter a holistic perspective of the issues of the research environment has been provided. An overview of the key focus areas was given, and the problems that are currently hampering the knowledge transfer process. The department as well as the University needs to focus and address the factors that prevent the transfer of knowledge and to narrow the gap between knowledge at University and knowledge required by industry.

CHAPTER 3: KNOWLEDGE TRANSFER FROM UNIVERSITY TO INDUSTRY: A LITERATURE REVIEW

3.1 INTRODUCTION

Knowledge plays a key role in the information revolution. Major challenges are to select the “right” information from numerous sources and transform it into useful knowledge, (Smith, 2001:311). Gordon (2000:72), are of the opinion that knowledge is a subject for debate, and precise definitions are still elusive. The meaning of knowledge is largely relative. The author believes that knowledge is a complex concept and is itself invisible, which leads to difficulties for those attempting to manage knowledge.

It is important to determine what, and who, is involved in the knowledge transfer process. Rossi (2010:155), observed that researchers in certain fields are particularly active in knowledge transfer, and that the determinants of the intensity of knowledge transfer activities are generally specific to particular research areas.

Cohen and Levinthal (1990:128), state that outside sources of knowledge are often critical to the innovation process, whatever the organizational level at which the innovating unit is defined. The ability to exploit external knowledge is thus a critical component of innovative capabilities. They argue further that the ability to evaluate and utilize outside knowledge is largely a function of the level of prior related knowledge.

Research has been done regarding the use of Quality tools and techniques and the link to the way knowledge is transferred. There is an inclination to improve quality management in organisations. According to Bunney and Dale (1997:184), it is remarkable that many of the simple, yet powerful, tools are not fully integrated within the day to day process improvement aspects of business and industry. Quality cannot be separated from any activity in any organization, but the significance of the successful implementation of it is becoming more apparent. The challenges that organisations are facing can be both complex and unpredictable.

The aim of superior organisations is to bring to the market attractive, high value-added products in the shortest possible time, and this is the means by which they maintain their competitive edge – the application of quality tools and techniques is a key issue in this connection (Spring, McQuater, Swift, Dale & Booker, 1998:45).

Top Management commitment is a crucial part of the quality process and the transfer of knowledge in any organization. Dalgleish (2002:56), strongly agrees with Deming, that getting top management support is critical to any quality improvement campaign. The issue is not how to get management support, but how to regain the support that justifiably has been lost. Dalgleish (2002:56), also states that support can be regained, but not without significant effort. He also states that, in most cases, blaming top management is nothing more than a self-victimizing excuse to do nothing to change what frustrates most quality professionals. According to Smith (2001:311), valuable human and knowledge resources will be wasted, unless management openly accepts and supports efforts to gather, sort, transform, record and share knowledge.

Perceptions and implications of knowledge management and knowledge transfer differ from organization to organization, yet the basics, which involve information and people, should be focused on in every organisation. It is important that the implications of knowledge management are understood, in order to successfully transfer knowledge. Alavi and Leidner (2001:111), list the implications for knowledge management as follows:

- Focuses on exposing individuals to potentially useful information and facilitating assimilation of information.
- Involves enhancing individual's learning and understanding through provision of information.
- A key issue is building and managing knowledge stocks.

- Focuses on knowledge flows and the process of creation, sharing and distributing knowledge.
- Focuses on organized access to, and retrieval of content.
- Is about building core competencies and understanding strategic know-how.

In order for knowledge to be transferred effectively, there needs to be a fit between individual readiness to transfer knowledge and organisational receptivity to knowledge (Lazarova & Tarique, 2005:369).

3.2 KNOWLEDGE TRANSFER CHANNELS

Knowledge transfer is becoming increasingly important in organisations. Firms of today are more organized on a global basis. In order to take advantage of differences in expertise, labour costs and access to markets should be taken into account (Argote, Ingram, Levine & Moreland, 2000:2). The authors also mention that realizing the benefits from new relationships hinges on the success of knowledge transfer between organizations.

There are three components in successful knowledge exchange: find, engage and understand (McNamee, Schoch, Oelschlaeger and Huskey, 2010:**Online**). They state that people must find one another, or somehow recognize the potential for collaboration; both potential participants must be motivated to some minimal engagement level necessary to transfer knowledge; and the participants must share enough of the same knowledge frameworks and language to be able to communicate with, and learn from one another.

Osterloh and Frey (2000:538), state that knowledge generation and transfer is an essential source of firms' sustainable competitive advantage. Knowledge transfer is important in any business, yet there are a number of challenges and uncertainties as to what it entails. As technological knowledge cumulates and expands, firms become increasingly dependent on a wider range of scientific and technological knowledge fields, in order to develop their innovations (Antonelli & Calderini, 2008:25).

The knowledge transfer process is considered to be a process of activities, and should be communicated, in an organization, by top management. Generating information or knowledge is important to maintain a free flow of communication and to improve processes. (Nonaka, 1994:27) conceptualizes the organizational knowledge creation process in Figure 3.1 below:

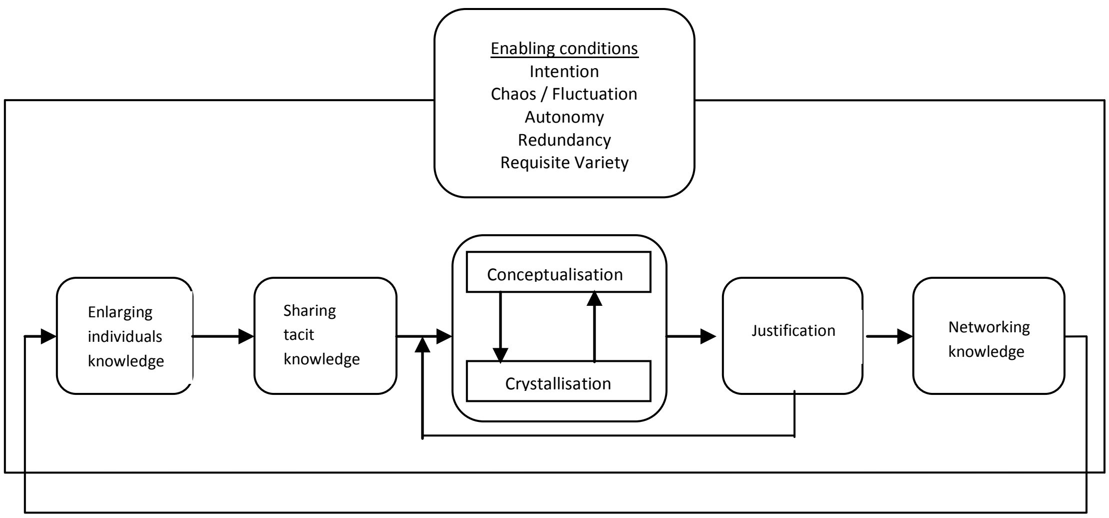


Figure 3.1: Process of generating information/knowledge in the market (**Source**: Nonaka, 1994: 14-37)

Nonaka (1994:14), states that any organization that dynamically deals with a changing environment ought not only to process information efficiently, but also to create information and knowledge. He further states that knowledge is a multifaceted concept with multilayered meanings.

3.3 TRANSFERRING EXPLICIT AND TACIT KNOWLEDGE

In any organization, it is important that a common goal and vision is shared amongst employees in the organization. This could improve the transfer of knowledge. Lang (2004:90), believes that knowledge consists of both explicit and tacit elements, and distinguishes between the two as follows:

- Explicit knowledge is that which can be articulated and codified and which, therefore, transmits easily.
- Tacit knowledge is widely dispersed, residing in patterns of heedful interactions between individuals within a shared area of competence.

Members in an organization, however, cannot be forced to share their tacit knowledge. It is therefore difficult for any organization to gather tacit knowledge. Tacit knowledge, in particular, is lost through outsourcing, downsizing, mergers and terminations (Smith, 2001:311). Osterloh and Frey (2000:546), argue that the transfer of tacit knowledge within and between teams cannot be directly observed, and the output cannot be attributed to a particular employee. At best, managers can observe the result of knowledge generation and transfer in terms of output. They further argue that explicit knowledge, on the other hand, is tradable, and managers are more capable of observing how well workers with individual knowledge have performed in this respect, and can reward them accordingly. The critical distinction between the two lies in transferability and the mechanisms for transfer across individuals, across space, and across time (Grant, 1996:111).

Brennenraedts, Bekkers and Verspagen (2006:2), make a clear distinction between explicit and tacit knowledge. According to the authors, the nature of explicit knowledge is that it can be transferred without the presence of people. Explicit knowledge flowing between university and industry can exist, of patents, scientific articles, books etc. Tacit knowledge however, is embodied in people and cannot be transferred without them. It is the knowledge that people acquire by actually doing their job and conducting research and it cannot (yet) be transferred by writings or drawings. Balconi *et al*. (2003:128), states the exchange of tacit knowledge between university and corporate researchers requires the two social groups to share some acquaintances and/or a few codes of behaviour in terms of reciprocity and fairness.

Trust plays an important role in the successful transfer of tacit knowledge. Tacit knowledge transfer is likely to be more successful when there is higher trust amongst internal and external project team members (Foos, Schum & Rothenberg, 2006:8). Irick (2007:4), believe that managers should encourage and support the creation and exchange of tacit knowledge and that they should act as “knowledge brokers”, contributing to the diffusion of knowledge across and between communities. He further argues that one of the most important ways to manage tacit knowledge is to offer personnel training and exercises to allow the individual to access the knowledge realm of the group, and the entire organization. One of the ways that can support explicit knowledge management is to make the knowledge visible in some real way, Gordon (2000:78).

According to Nonaka (1994:24), the sharing of experience is important, and in order for the self-organizing team to start the process of concept creation, it first needs to build mutual trust among members. The concept of creation involves a difficult process of externalization, i.e., converting tacit knowledge (which by nature is hard to articulate) into an explicit concept. This challenging task involves repeated, time-consuming dialogue between members. Opportunities to use tacit knowledge are prime factors in attracting and maintaining a talented, loyal, and productive workforce (Smith, 2000:240).

The assumption that knowledge is created through conversion between tacit and explicit knowledge allows us to postulate four different “modes” of knowledge conversion (Nonaka, 1994:19). The four modes of knowledge conversion are shown in Figure 3.2 below:

From / *To*	Tacit Knowledge	Explicit Knowledge
Tacit Knowledge	Socialisation	Externalisation
Explicit Knowledge	Internalization	Combination

Figure 3.2: Modes of the Knowledge Creation (**Source**: Nonaka, 1994:14-37)

- Socialisation is the process that transfers tacit knowledge from one person to tacit knowledge in another person.
- Externalisation is the process for making tacit knowledge explicit among individuals within a group.
- Combination refers to the knowledge transfer once knowledge is explicit.
- Internalisation is the process of understanding and absorbing explicit knowledge into tacit knowledge held by the individual.

Alavi and Leidner (1999:6), state two major points that stem from the conceptualization of knowledge:

- Because knowledge is personalised, in order for one person's knowledge to be useful to another, it must be communicated in such a manner as to be interpretable and accessible to the other person.
- Hoards of information are of little value: only that information which is actively processed in the mind of an individual through a process of reflection, enlightenment and learning can be useful. Knowledge management, then, refers to a systemic and organizationally specified process for acquiring, organising and communicating both tacit and explicit knowledge of employees so that other employees may make use of it to be more effective and productive in their work.

Organisations that recognize and use their employees' steadily growing wealth of tacit and explicit knowledge to solve problems and achieve goals have a major competitive advantage. However, many organizations need to improve how they acquire and share tacit and explicit knowledge (Smith, 2001:319). The author is also of the opinion that despite globalisation, cultural diversity, and keeping pace with the "trend of the day", people acquire and apply tacit and explicit knowledge in their own way.

3.4 KNOWLEDGE AT UNIVERSITY AND THE TRANSFER TO INDUSTRY

Despite the many studies that have already been made of aspects of the transition from university to the world of work, and despite the best efforts of higher education institutions to establish links with industry and to ensure that there are employment opportunities for their graduates, there is one particular aspect of the interface between university and the world of work which, although significant, has received little attention; namely, what happens to new graduate employees in terms of their learning processes (Candy & Crebert, 1991:570).

University-industry knowledge transfer is nowadays a key research subject, both in economics and management studies, as well as a top entry in the science and technology policy agenda of a number of developed and developing countries (Balconi, Breschi & Lissoni, 2003:127).

Agrawal (2001:297), explored the characteristics of the various channels through which knowledge is transferred from the university to industry. The author states that the channels of transfer between university and industry include publications, patents, consulting, informal meetings, recruiting, licensing, joint ventures, research contracts, and personal exchange.

The transfer of knowledge can be perceived in different ways. Who is responsible for knowledge transfer? Harrington and Kearney (2010:121), state that the lack of knowledge transfer relates to the self-referential nature of different social systems inhabited by researchers and management practitioners. They further argue that researchers and management practitioners fail to imagine scenarios other than those of the traditional classroom and the existing systems of academics published in referred journals. D’Este and Patel (2007:1298) are of the opinion that the practices established by university departments might strongly influence the disposition of researchers to set up networks with users of their research. The scale of research resources and the quality of research are among the department characteristics most frequently associated with more intensive interaction with industry.

Given the diversity of knowledge, and the way it interacts with economic processes, it is not surprising that there is also a variety of potential channels through which knowledge is transferred (Brennenraedts *et al*, 2006:5). According to Gordon (2000:78), by investigating the knowledge needed in a particular area of study (in a finer way) and then mapping out this knowledge, using learning dependency, prior knowledge assumptions will be clear to both student and teacher. Students would see the "bigger picture", and by learning dependency they would know how and where to apply knowledge.

Rossi (2010:155), believes that university-industry knowledge transfer activities take place through a wide spectrum of governance forms, ranging from the simple use of openly disseminated academic knowledge on the part of firms, to long-term university-industry partnerships whose features are regulated by complex arrangements.

Universities play a prominent role in discussions of the production, diffusion, and deployment of knowledge and innovation that supports economic growth. While universities have long served as a source of technological advances for industry, university-industry collaboration has intensified in recent years (Bercovitz & Feldmann, 2006:175). Recent academic explorations of the nature of knowledge have included discussion of the relationship between the kind of knowledge in play and its transfer and transferability (Ozga & Jones, 2006:1).

Universities are involved in industry in a number of ways. Service learning is a form of involvement where universities assist industry in various areas. Universities also benefit from industry, and in some cases funding from industry forms a big part of the universities' development funds. However, it is only beneficial if it is formally managed through contracts by both the university and industry. Bodas-Freitas, Geuna and Rossi (2010:7), state that more and more universities are organising and supporting interactions between academics and firms. In most cases, the creation of an institutional infrastructure for the exchange of knowledge between universities and firms is a direct or indirect result of policy actions, oriented towards structured knowledge transfer activities within universities.

Geuna and Muscio (2009:93), are of the opinion that universities have long been involved in knowledge transfer activities. Yet the last 30 years have seen major changes in the governance of university–industry interactions. The authors further state that knowledge transfer has become a strategic issue: as a source of funding for university research, and (rightly or wrongly) as a policy tool for economic development. Universities vary enormously in the extent to which they promote and succeed in commercializing academic research. The identification of clear-cut models of governance for university–industry interactions and knowledge transfer processes is not straightforward.

Etzkowitz (1998:833), is of the opinion that the entrepreneurial university integrates economic development into the university as an academic function along with teaching and research. The author elaborates upon the above and says it is this “capitalization of knowledge” that is at the heart of a new mission for the university, linking universities to users of knowledge more tightly, and establishing the university as an economic actor in its own right.

3.5 KNOWLEDGE REQUIRED BY INDUSTRY

In general, there is a specific focus at universities and industry on knowledge transfer, and how it impacts on certain processes and the application of knowledge in different fields. The importance of different channels of university-industry knowledge transfer can be assessed differently by firms in different industries. After all, firms active in different industries make use of different technological and market knowledge (Bekkers & Freitas, 2008:1837).

According to Bekkers and Freitas (2008:1839), it is expected that large firms, given their higher financial and skills resources, favour collaborative and contract research as forms of absorbing university produced or co-produced knowledge. Small firms are expected to benefit more from the influx of students, who bring along new knowledge from the university. Interaction between University and industry does not mean just transferring knowledge from the University to industry; knowledge transfer works in both directions (Geuna & Muscio, 2009:103).

Argote *et al.* (2000:1), are of the opinion that organisations that are able to effectively transfer knowledge from one unit to another are more productive and more likely to survive than those that are less adept at knowledge transfer. Although organisations are able to realise remarkable increases in performance through knowledge transfer, successful knowledge transfer is difficult to achieve. Grant (1996:111), argues that, at both individual and organisational level, knowledge absorption depends on the recipients' ability to add new knowledge to existing knowledge.

To explain the knowledge requirement of production in industry, Grant (1996:112), makes the following statement: "Production involves the transformation of inputs into outputs. Fundamental to a knowledge-based theory of the firm is the assumption that the critical input in production, and primary source of value is knowledge. Indeed, if we were to resurrect a single-factor theory of value in the tradition of the classical economists' labour theory of value or the French Physiocrats land-based theory of value, then the only defensible approach would be a knowledge-based theory of value, on the grounds that all human productivity is knowledge dependent, and machines are simply embodiments of knowledge".

It's all about the transfer of tangible and intellectual property, expertise, learning and skills between academia and the non-academic community. When students graduate and join the workforce, they bring with them new knowledge, and are effectively helping to 'regenerate the gene pool' of industry. The temporary placement of students and graduates in companies or in the public or voluntary sectors can be a more directed way of exchanging knowledge on a shorter term basis (Research Councils UK, 2009: **Online**).

3.6 KNOWLEDGE TRANSFER – BENEFITS OF QUALITY TOOLS AND TECHNIQUES

The use and application of quality tools and techniques within an effective problem solving methodology are essential to understand and facilitate improvement in any process (Spring *et al.*, 1998:46). What are tools and techniques? According to McQuater *et al.* (1995:38), they are practical methods, skills, means or mechanisms that can be applied to particular tasks. They are used to facilitate positive change and improvements. Dale and McQuater (1998:43), report that the use of tools and techniques is not as widespread and effective as might be expected, and suggested that part of the problem is due to insufficient training in the use and application of these approaches.

The question also arises whether quality tools and techniques could be used for effective knowledge transfer. Quality management theory has been influenced by the contributions made by quality leaders, such as Crosby, 1979; Deming, 1982; Ishikawa, 1985; Juran, 1988 and Feigenbaum, 1991. The research by all these authors shows both strengths and weaknesses, for none of them offers all the solutions to the problems encountered by firms, although some common issues can be observed, such as management leadership, training, employees' participation, process management, planning and quality measures for continuous improvement (Tari & Sabater, 2003:268).

Tools cannot provide results by themselves. They must be developed to reflect the companies' culture and management visions (Govers, 2000:158). Management should be aware of the challenges and weaknesses in an organization in order to understand where and how tools and techniques could be of use in the organization.

Top management also plays an important role in the implementation of quality tools and techniques. It is important that top management supports quality improvement plans and the use of quality tools and techniques could be used to monitor the quality process.

3.7 KNOWLEDGE MANAGEMENT ENABLERS

There are different opinions on knowledge management enablers. Yeh, Lai and Ho (2006:801), suggest the following enablers are crucial for organization effectiveness:

- Corporate Culture
- People
- Information Technology
- Strategy and Leadership

Enablers form a mechanism that stimulates members to develop knowledge, break the obstacles of knowledge development and encourage members to share their knowledge and experiences (Ho, 2009:101). This author divides knowledge management enablers into four categories, namely; strategy and leadership, organizational culture, organizational incentive system and information technology. These four categories are elaborated upon below.

Table 3.1: Definition of operational variables (**Source:** Ho, 2009: 98-117)

Dimension	Research variable	Definition of operational variable
Knowledge management enabler	Strategy and leadership	The knowledge management strategy must work with organisational strategies and goals. Aside from this, organisational leaders should give their support to knowledge management and clearly plan and promote knowledge management.

	Organisational culture	In the process of implementing knowledge management, organisational culture should be a culture that encourages employees to create and share knowledge. An environment that is favourable to interaction, open-mindedness and trust should be established, as well as a culture with values, norms and habits that encourage knowledge sharing.
	Organisational incentive system	An organisational structure must be able to support knowledge management operation. Aside from this, the most important factor of knowledge management is human resources. Therefore, a performance incentive mechanism is important. It encourages employees to embrace knowledge management in order to get rewards from it, and this further generates company competitive advantages.
	Information technology	Information technology can support information acquisition, process improvement, and knowledge storage. Employees can therefore work conveniently with knowledge management. It also encourages employees to utilize the IT search function, and to acquire and systematically store knowledge for their own use.

From information drawn from literature, it is clear that there is an overlap in most of the enablers listed by researchers. Ho (2008:101), believes that knowledge management enablers are critical factors that put knowledge management concepts into practice, in order to achieve knowledge management effectiveness. He also believes that information technology in an organisation is the fundamental driving force that puts knowledge management into practice, making it a vital knowledge management enabler.

3.8 KNOWLEDGE MANAGEMENT BARRIERS

The emphasis on knowledge in today's organizations is based on the assumption that barriers to the transfer and replication of knowledge endow it with strategic importance Alavi & Leidner (1999:2). Thus, many organizations are developing information systems designed specifically to facilitate the sharing and integration of knowledge.

There could be a number of knowledge management barriers present in an organisation. Although it could vary, the most common barrier in any organisation could directly be linked to people. Riege (2007:52), is of the opinion that people barriers can be overcome. He listed people barriers as follows:

- Lack of time.
- Apprehension towards sharing their knowledge.
- Low awareness of the benefits of knowledge transfer.
- Perceiving knowledge sharing as intrusive and extra work.
- Existing information overload.
- Displaying dominance in sharing explicit, over tacit, knowledge.
- Resistance to sharing knowledge.
- Poor communication and interpersonal skills.
- Fear of loss of intellectual property.
- Lack of trust in the accuracy and credibility of transferred knowledge.
- Differences in cultures.

Riege (2007:58), also believes that organisational barriers can influence the knowledge transfer process. He listed organisational barriers as follows:

- Overlooking the alignment and integration of knowledge management strategies and transfer initiatives with its goals and strategic approach.
- Lack of leadership and managerial direction in terms of clearly communicating the benefits and values of knowledge sharing practices.

- The practice of a strong hierarchy, with managers thriving on position-based status and formal power.
- Insufficient formal and informal spaces to collaborate, reflect and generate (new) knowledge.
- Introducing a reward and recognition system that does not work.
- The organisation needs a cultural change on one or more dimensions.
- The organisation shows a low knowledge retention rate of highly skilled and experienced staff.
- Insufficient resources and infrastructure to successfully support transfer practices and opportunities.
- The organisation displays a high level of external competitiveness within and across business units.
- The organisation displays a high level of internal competitiveness in business units.
- The organisation suffers from communication flows that are restricted into certain directions.
- The organisation displays a physical work environment and layout of work areas that restrict knowledge transfer.
- The hierarchical structure inhibits knowledge flows.
- The business units are too large and unmanageable to enhance contact.

Individual knowledge and the culture of sharing knowledge in an organisation are very important, and sometimes underestimated. The sharing of knowledge is too often compromised, if not completely sacrificed, at the altar of norms and practices that advocate and reinforce the supremacy of individual knowledge (De Long & Fahey 2000:118). They further also state that when people are asked to put what they know into an organisational system, they tend to feel they have lost ownership of the knowledge they alone had previously controlled. De Long and Fahey (2000:118), continue by saying that culture mediates the relationship between levels of knowledge. Culture embodies all the unspoken norms, or rules, about how knowledge is to be distributed between the organisation and the individuals in it.

3.9 KNOWLEDGE CREATION AND SHARING

Knowledge sharing creates opportunities to maximize a company's ability to meet those needs and generates solutions and efficiencies that will give a business its competitive advantage (Reid, 2003:43). Since knowledge sharing, especially tacit knowledge is a common problem in organizations. Reid (2003:43), argues that by encouraging knowledge sharing, it offers the organisation the potential for increased productivity as well as retention of intellectual capital, even after individuals leave the organisation. Lin (2007:315), says knowledge sharing can be defined as a social interaction culture, involving the exchange of employee knowledge, experiences and skills through the whole department or organisation.

Socialisation, as part of an organisation's culture, can become one of the important tools in creating and sharing knowledge. Employees could share experiences and learn from each other. Malhotra (2002:**Online**), defines socialisation as the process of sharing experiences, and thereby creating tacit knowledge, such as shared mental models and technical skills. The key to acquiring tacit knowledge is experience. Without some shared experience, it is extremely difficult for one person to project her/himself into another individual's thinking process. Adenfelt and Lagerstrom (2005:192) are of the opinion that knowledge creation rests upon the individuals performing activities in which their existing tacit and explicit knowledge is shared and combined, for refinement of activities and for development of new knowledge.

The creation of knowledge should be encouraged through relations between individuals and teams in the organisation, in order to provide a competitive advantage. The creation of knowledge, therefore, requires cooperation among individuals and units, acknowledging the value of particular knowledge – often emanating from collaboration with external counterparts – is important, especially knowledge of individuals from different units (Adenfelt & Lagerström, 2005:192). Having a number of direct exchange partners provides an individual with the opportunity to obtain resources, while the strength of the relationships provides the opportunity to develop the jointly held resources (McFadyen & Cannella, 2004:735). McFadyen and Cannella (2004:735), elaborate by saying knowledge is recognized as one of the most important resources of the 21st century and has received considerable attention in management literature. They define new knowledge as discoveries about phenomena that were not known previously.

Nonaka, Toyama and Konno (2000:13), believe that knowledge needs a context to be created. In knowledge creation, one transcends the boundaries between self and other, inside and outside, past and present. They are of the opinion that, in order to create knowledge dynamically and continuously, an organization needs a vision that synchronises the entire organization. Figure 3.3 illustrates the knowledge creation process.

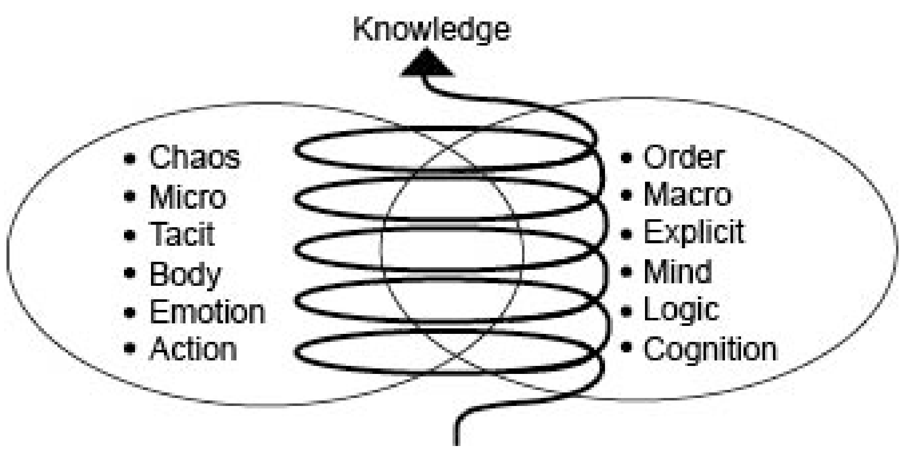


Figure 3.3: Knowledge created through a spiral (**Source**: Nonaka *et al.*, 2000: 5-34)

A study of companies where sharing knowledge is built into the culture, found that they did not change their culture to match their knowledge management initiatives, but adapted their approach to knowledge management, to fit their culture (McDermott & O'Dell, 2001:76). According to the authors, these companies changed their approach by doing the following:

- Linking sharing knowledge to solving practical business problems.
- Tying sharing knowledge to a pre-existing core value.

- Introducing knowledge management in a way that matches the organisation's style.
- Building on the existing networks people use in their daily work.
- Encouraging peers and supervisors to exert pressure to share.

According to Liebowitz and Megbolugbe (2003:193), the knowledge management cycle includes the following steps:

- Knowledge identification and capture.
- Knowledge sharing.
- Knowledge application.
- Knowledge creation.

The authors state that, once the critical knowledge is identified and captured, it is typically shared with others, and those individuals then apply this knowledge and internalize it to their situation, which in turn creates new knowledge. This "new" knowledge is then captured, shared, applied, and the cycle continues.

3.10 CONCLUSION

From the literature discussed in this chapter, it is evident that established knowledge transfer links between university and industry is to the advantage of graduates when they make the transition from university to industry. Knowledge transfer can be perceived in different ways and it is therefore important to determine the specific needs of the university as well as industry in order to transfer knowledge effectively. In the next chapter the questionnaire design and research design and methodology will be elaborated upon.

CHAPTER 4: RESEARCH DESIGN AND METHODOLOGY

4.1 AIM OF THIS CHAPTER

The aim of this chapter is to determine the key elements which are critical for successful knowledge transfer between University and industry. The objective is to determine the shortcomings and to improve on them. The research problem statement reads as follows: "Academic knowledge gleaned at University does not meet the requirements of industry"

4.2 THE SURVEY ENVIRONMENT

The research study focused on the successful knowledge transfer from University to industry, and the narrowing of the gap between knowledge at University and knowledge required by industry. In this study, Advisory Board members and employers involved with the monitoring and evaluation of students in the industrial engineering industry will form the survey sample.

4.3 THE TARGET POPULATION

The industry target population which formed the sample was made up from Advisory Board members, and placement and monitoring contacts in the Industrial Engineering department. A total of 132 companies are on the database, and questionnaires were distributed to all these companies. The Department of Systems Engineering has 9 permanent academic staff members.

Leedy and Ormrod as cited by Watkins (2010:56), are of the opinion that, when sampling, the larger the sample, the better. They give the following guidelines for determining sample sizes:

- **Small populations (less than 100):** The entire population
- **Around 500:** 50% of the population

- **Around 1500:** 20% of the population
- **Around 5000 or more:** Sample size of at least 400

4.4 MEASUREMENT SCALES

The survey used check boxes, and is based on the Likert scale. According to Emery and Cooper as cited by Watkins (2010:162), the advantages of using the Likert scale are that they are:

- Easy and quick to construct.
- Each item meets and empirical test for discriminating ability.
- The Likert scale is also treated as an interval scale.

4.5 SURVEY DESIGN

According to Leedy & Ormrod as cited by Watkins (2010:140) a survey is simple in design. The researcher poses a series of questions to willing participants; summarizes their responses with percentages, frequency counts, or more sophisticated statistical indexes; and then draws inferences about a particular population from the responses of the sample. The following process depicts the execution of a questionnaire bases survey:

- Evaluate the research question (or hypothesis statement), the investigative (sub) questions, and the key research objectives. Thereafter, map the proposed questionnaire based survey questions to these entities.
- In addition, consider any other information, which is relevant to the research and formulate the questionnaire based questionnaire based questionnaire accordingly.
- Identify the sample frame from the target population, and select a representative sample.
- Choose an interviewing method.
- Conduct a pilot survey to ensure that the questions are easily understood and clear to the respondents.

- Conduct the survey.
- Data processing follows – coding and input of data using statistical software.
- Data analysis – descriptive analysis and statistical inferences.
- Report formulation – drawing conclusions and interpret findings.

All questions in the survey have been designed with the following in mind:

- Avoiding double-barreled statements.
- Avoiding double-negative statements.
- Avoiding prestige bias.
- Avoiding leading statements.
- Avoiding the assumption of prior knowledge.

The questionnaire that was sent to Industry consisted of 20 questions. A sample of the questions compiled for industry is shown in Table 4.1 below. A full questionnaire is included as Appendix 1.

Table 4.1: Sample questionnaire for industry (**Source:** Own source)

INDUSTRY DEMANDS WITH RESPECT TO KNOWLEDGE TRANSFER FROM GRADUATE STUDENTS						
		Completely agree	**Mostly agree**	**Undecided**	**Mostly disagree**	**Completely disagree**
1	Your organisation informs the University of what is expected in industry	1	2	3	4	5
2	Students are given the opportunity to apply their knowledge in industry	1	2	3	4	5
3	The organisation communicates shortcomings in students' knowledge and knowledge transfer abilities to the University	1	2	3	4	5
4	Regular discussions with the University, with regard to student projects, are held	1	2	3	4	5
5	Student projects are practical and can be applied in industry	1	2	3	4	5
6	Students' knowledge can be used to improve processes and performance in the organisation	1	2	3	4	5

The questionnaire that was completed by staff members consisted of 14 questions, and targeted statements that involve the University and industry. A sample of the questions compiled for staff members is shown in Table 4.2 below. A full questionnaire is included as Appendix 2.

Table 4.2: Sample questionnaire for staff (**Source:** Own source)

CRITICAL SHORTCOMINGS AT UNIVERSITY						
		Completely agree	**Mostly agree**	**Undecided**	**Mostly disagree**	**Completely disagree**
1	There is a lack of sharing of knowledge and expertise between University and industry	1	2	3	4	5
2	The University has regular contact sessions with students in industry (could be in the form of surveys or interviews)	1	2	3	4	5
3	The Department has a staff member, known to industry, who deals with industry related matters i.e. student placements and progress	1	2	3	4	5
4	Industry linkages are encouraged at University level, and industry is informed of possible collaborations	1	2	3	4	5

4.6 DATA VALIDITY AND RELIABILITY

According to Collis and Hussey as cited by Watkins (2010:67), ‘validity’ is concerned with the extent to which the research findings accurately represents what is happening. More specific, whether the data is a true picture of what is being studied. According to Cooper and Schindler as cited by Watkins (2010:67), three major forms of validity can be identified, namely ‘content validity’, ‘criterion-related validity’ and ‘construct validity’. Reliability (also referred to as ‘trustworthiness’), is concerned with the findings of the research (Collis & Hussey cited by Watkins 2010:68). The findings can be said to be reliable if you or anyone else repeated the research and obtained the same results.

4.7 CONCLUSION

In this chapter the survey environment and design was elaborated upon, and the target population and the size of the sample was defined. Details were given with regard to the questionnaires. The results of the survey will be analyzed in detail in Chapter 5.

CHAPTER 5: DATA ANALYSIS AND INTERPRETATION

5.1 INTRODUCTION

Data analysis is "the process of bringing order, structure and meaning to the mass of collected data" (de Vos 2002, 339). This chapter discusses the statistical analysis of the questionnaires distributed to industry and staff in the Department of Industrial and Systems Engineering. The aim of this study is to determine the mechanism that can be implemented by the University to narrow the gap between University knowledge and industry requirements. In this chapter the data obtained from the completed questionnaires will be presented and analysed.

In most social research the analysis entails three major steps in the following order:

- Cleaning and organising the information that was collected, which is called the data preparation step,
- Describing the information that was collected (Descriptive Statistics); and
- Testing the assumptions made through hypothesis and modelling (Inferential Statistics).

The responses to the questionnaire developed by the researcher have been analysed with the use of SAS software. These included:

- Obtaining information about the particular demands from industry in respect of knowledge transfer from graduate students.
- Critical shortcomings at University in respect of knowledge transfer to students, and thereafter to industry.
- The key elements which are critical for successful knowledge transfer.
- Remedial actions that industry should implement to meet the demands created by the knowledge gap between University and industry,

5.2 METHOD OF ANALYSIS

5.2.1 Validation of Survey results

A descriptive analysis of the survey results returned by the research questionnaire respondents is reflected below. The responses to the questions obtained through the questionnaires are indicated in table format for ease of reference. Data validation is the process of ensuring that a programme operates on clean, correct and useful data. The construct validation, however, can only be taken to the point where the questionnaire measures what it is supposed to measure. Construct validation should be addressed in the planning phases of the survey, and when the questionnaire is developed. This questionnaire is supposed to measure mechanisms that can be implemented by the University to narrow the gap between University knowledge and industry requirements. The Department of Industrial and Systems engineering at the Cape Peninsula University of Technology and the Industrial Engineering industry form part of this survey.

5.2.2 Data format

The data was received in 2 questionnaires, one for the industry and one for the staff at the University. These were coded and captured on a database developed on Microsoft Access for this purpose. These questionnaires were captured twice and then the two datasets were compared to minimise capturing mistakes. When the database had been developed, use was made of rules in respect of the questionnaire that set boundaries for the different variables (questions). For instance, if the Lickert scale is used, as follows:

- Completely agree is coded as 1
- Mostly agree is coded as 2
- Undecided is coded as 3
- Mostly disagree is coded as 4
- Completely disagree is coded as 5.

A boundary is set on Microsoft Access as less than 6. This means if the number 6 or more than 6 is captured an error will show until a number less than 6 is captured. It was then imported into SAS-format through the SAS ACCESS module. This information, which had been double checked for correctness, was then analysed by the custodian of this document.

5.2.3 Preliminary analysis

The reliability of the statements in the questionnaire, posed to the respondents from the University and from the industry, is measured by using the Cronbach Alpha test. (See paragraph 5.3.1). A Uni-variate descriptive analysis is performed on all the original variables; displaying frequencies, percentages, cumulative frequencies, cumulative percentages, means, standard deviations, range, median, mode etc. These descriptive statistics are discussed in paragraphs 5.3.2 and 5.3.3. (See also computer printouts in Annexure B & C).

5.2.4 Inferential statistics

Inferential statistics that will be used are:

- Cronbach Alpha test. Cronbach's Alpha is an index of reliability associated with the variation accounted for by the true score of the "underlying construct". Construct is the hypothetical variables that are being measured (Cooper & Schindler, 2001:216-217). Another way to put it would be that Cronbach's Alpha measures how well a set of items (or variables) measures a single uni-dimensional latent construct. When data has a multidimensional structure, Cronbach's Alpha will usually be low.
- Chi-square tests for nominal data. The Chi-square (two-sample) tests are probably the most widely used nonparametric tests of significance that are useful for tests involving nominal data, but can be used for higher scales as well, like cases where persons, events or objects are grouped in two or more nominal categories, such as 'yes-no' or cases A, B, C or D. The technique is used to test for significant differences between the observed distribution of data among categories and the expected distribution based on the null hypothesis. It has to be calculated with actual counts rather than percentages (Cooper & Schindler, 2001:499).
- Mann-Whitney U test or Wilcoxon rank-sum test for ordinal data with two independent samples. The **Mann-Whitney U test** (also called the **Mann-Whitney-Wilcoxon (MWW)**, **Wilcoxon rank-sum test**, or **Wilcoxon-Mann-Whitney test**) is a non-parametric test for assessing whether two samples of observations come from the same distribution. The null hypothesis is that the two samples are drawn from a single population, and therefore that their probability distributions are equal. It requires the two samples to be independent, and the observations to be ordinal or continuous measurements, i.e. one can at least say, of any two observations, which is the greater.

In a less general formulation, the Wilcoxon-Mann-Whitney two-sample test may be thought of as testing the null hypothesis that the probability of an observation from one population exceeding an observation from the second population is 0.05.

- One-way ANOVA is used to test for differences among two or more independent groups (means).
- The SAS software computes a P-value (Probability value) that measures statistical significance when comparing variables with each other, determining relationship between variables, or determining association between variables. Results will be regarded as significant if the P-values are smaller than 0.05, because this value presents an acceptable level on a 95% confidence interval ($p \leq 0.05$). The P-value is the probability of observing a sample value as extreme as, or more extreme than, the value actually observed, given that the null hypothesis is true. This area represents the probability of a Type 1 error that must be assumed if the null hypothesis is rejected (Cooper & Schindler, 2001:509).
- The p-value is compared to the significance level (α) and on this basis the null hypothesis is either rejected, or not rejected. If the P-value is less than the significance level, the null hypothesis is rejected (if P-value $<\alpha$, reject null). If the P-value is greater than or equal to the significance level, the null hypothesis is not rejected (if P-value $\geq\alpha$, do not reject null). Thus, with $\alpha=0.05$, if the P-value is less than 0.05, the null hypothesis will be rejected. The p value is determined by using the standard normal distribution. The small P-value represents the risk of rejecting the null hypothesis.
- A difference has statistical significance if there is good reason to believe the difference does not represent random sampling fluctuations only. Results will be regarded as significant if the P-values are smaller than 0.05, because this value is used as cut-off point in most behavioural science research.

5.2.5 Assistance to Researcher

The conclusions made by the researcher, were validated by the statistical report. Help was given to interpret the outcome of the data. The final report written by the researcher was validated and checked by the statistician to exclude any misleading interpretations.

All inferential statistics are discussed in paragraphs 5.3.4.

5.2.6 Sample

The target population is staff of the department of Industrial and Systems Engineering at CPUT, and employees from the Industrial Engineering industry. A convenient sample of 33 employees from the Industrial Engineering industry and 6 staff members from the department of Industrial and Systems Engineering at CPUT was drawn.

5.3 ANALYSIS

In total 33 respondents from the Industrial Engineering industry and 6 staff members from the department of Industrial and Systems Engineering at CPUT completed the questionnaires. Descriptive statistics will be given for each variable, and only the respondents who completed the entire questionnaire will be utilized in the inferential statistics.

The numbering of the questions on the two questionnaires (one for staff and one for industry) differed. In order to compare the responses of the same questions/statements between two types of respondents (Staff and industry) the following adaptions in respect of the numbering of the questions/statements for staff were applied:

Table 5.1: Adaption of staff questionnaire numbering

Question / Statement	Original numbering for staff	New numbering for staff	Original numbering for industry
1. Your organisation informs the University of what is expected in industry.			Q1n
2. Students are given the opportunity to apply their knowledge in industry.			Q2n
3. The organisation communicates shortcomings in students' knowledge and knowledge transfer abilities to the University.			Q3n
4. Regular discussions with the University regarding student projects, are held.			Q4n
5. Student projects are practical and can be			Q5n

applied in industry.			
6. Students' knowledge can be used to improve processes and performance in the organisation.			Q6n
7. There is a lack of sharing of knowledge and expertise between University and industry.	Q1	Q7n	Q7n
8. The University has regular contact sessions with students in the industry.	Q2	Q8n	Q8n
9. The department has a staff member who is known to industry, who deals with industry related matters.	Q3	Q9n	Q9n
10. Industry linkages are encouraged at University level and industry is informed of possible collaborations.	Q4	Q10n	Q10n
11. There is a link between successful knowledge transfer and continuous improvement.	Q5	Q11n	Q11n
12. The application of quality tools and techniques contribute to knowledge transfer processes.	Q6	Q12n	Q12n
13. Creating an enabling environment is important for successful knowledge transfer.	Q7	Q13n	Q13n
14. A lack of knowledge transfer processes impacts negatively on the organisation's performance.	Q8	Q14n	Q14n
15. Industry is informed of Advisory Board meetings, and their input is encouraged.	Q15	Q15n	Q15n
16. The outcome of the Advisory Board meeting is communicated to the relevant industries.	Q16	Q16n	Q16n
17. Industry is involved in curriculum reviews.	Q17	Q17n	Q17n
18. Mechanisms are in place to track a student's transition from University to industry.	Q18	Q18n	Q18n

19. Students know how to apply their knowledge in industry.	Q19	Q19n	Q19n
20. Employees create an opportunity for students to apply their knowledge.	Q20	Q20n	Q20n

5.3.1 Reliability testing

Reliability tests (Cronbach's Alpha Coefficient) will be conducted on the questions/statements (which is the measuring instrument in this case) posed to the respondents of the Industrial Engineering industry and respondents from the department of Industrial and Systems Engineering at CPUT. As Q3 in the staff questionnaire has no variation (all the respondents selected the same choice), it will be left out of the reliability testing.

The results of the Cronbach Alpha tests for all the raw variables, except for Q3 which has no variation, are shown in table 5.2 for the staff of the university questionnaire and in table 5.5 for the industry questionnaire, and both computer printouts will be shown in Annexure A. The tables show the correlation between the respective item and the total sum score (without the respective item) as well as the internal consistency of the scale (coefficient alpha) if the respective item were to be deleted. By deleting the items (statements) one by one each time with the statement with the highest Cronbach Alpha value, the Alpha value will increase. In the right-most column of table 5.2, it shows that the reliability of the scale could be higher if some of these statements were to be deleted. Due to the extensive nature of Table 5.2, the table is contained within the ambit of Annexure C.

If statement Q1 is deleted from this measuring scale, the Cronbach Alpha Coefficient will increase to 0.7941. Table 5.3 will show this deletion. Due to the extensive nature of Table 5.3 , the table is contained within the ambit of Annexure D.

The result is that the Cronbach's Alpha Coefficients for each item are more than 0.70 (the acceptable level according to Nunnally, 1978**:** 245), and thus these items (statements) in the questionnaire, prove to be reliable and consistent for all the items in the scale.

In the original questionnaires the questions/statements are grouped into 3 scales where each of the scales indicates a different measurement in respect of whether academic knowledge at the University meets the requirements of industry. These subscales will also be tested for consistency and the results of consistency scale will be shown in table 5.4 and all the tests will be shown in Annexures J and K.

Table 5.4: Cronbach's Alpha Coefficient for each scale forming the measurement of knowledge gap between University and industry

Statements (Test all statements without current one's input)	**Variable nr.**	**Correlation with total**	**Cronbach's Alpha Coefficient**
KNOWLEDGE GAP BETWEEN UNIVERSITY AND INDUSTRY			
15. Industry is informed of Advisory Board meetings and their input is encouraged.	Q15	0.7326	0.8220
16. The outcome of the Advisory Board meeting is communicated to the relevant industries.	Q16	0.9100	0.7671
17. Industry is involved in curriculum reviews.	Q17	0.3450	0.8738
18. Mechanisms are in place to track a student's transition from University to industry.	Q18	0.6732	0.8236
19. Students know how to apply their knowledge in industry.	Q19	0.7050	0.8252
20. Employees create an opportunity for students to apply their knowledge.	Q20	0.6645	0.8306
Cronbach's Coefficient Alpha for standardized variables			**0.8640**
Cronbach's Coefficient Alpha for raw variables			**0.8528**

Table 5.4 shows that the scale for the knowledge gaps between University and industry measurement is inconsistent.

Due to the extensive nature of Table 5.5, the table is contained within the ambit of Annexure E.

The result is that the Cronbach's Alpha Coefficients for each item are more than 0.70 (the acceptable level according to Nunnally, 1978**:** 245), and thus these items (statements) in the questionnaire, prove to be reliable and consistent for all the items in the scale.

In the original questionnaires the questions/statements are grouped into 3 scales where each of the scales indicates a different measurement in respect of whether academic knowledge at the University meets the requirements of industry. These subscales will also be tested for consistency and the results of the consistent scale will be shown in tables 5.6 to 5.8, and all the tests will be shown in Annexures J and K.

Table 5.6: Cronbach's Alpha Coefficient for each scale forming the measurement industry demands

Statements (Test all statements without current one's input)	Variable nr.	Correlation with total	Cronbach's Alpha Coefficient
INDUSTRY DEMANDS WITH RESPECT TO KNOWLEDGE TRANSFER FROM GRADUATE STUDENTS			
1. Your organisation informs the University of what is expected in industry.	Q1	0.4753	0.7286
2. Students are given the opportunity to apply their knowledge in industry.	Q2	0.5159	0.7230
3. The organisation communicates shortcomings in students' knowledge and knowledge transfer abilities, to the University.	Q3	0.5300	0.7110
4. Regular discussions with the University in regard of student projects are held.	Q4	0.5921	0.6923
5. Student projects are practical and can be applied in industry.	Q5	0.6556	0.6742
6. Students' knowledge can be used to improve processes and performance in the organisation.	Q6	0.2445	0.7779
Cronbach's Coefficient Alpha for standardized variables			**0.7559**
Cronbach's Coefficient Alpha for raw variables			**0.7558**

If statement 6 in above mentioned scale is deleted the overall Cronbach Alpha Coefficient will increase to 0.7779.

Table 5.7: Cronbach's Alpha Coefficient for each scale forming the measurement of the key elements

Statements (Test all statements without current one's input)	Variable nr.	Correlation with total	Cronbach's Alpha Coefficient
KEY ELEMENTS WHICH ARE CRITICAL FOR SUCCESSFUL KNOWLEDGE TRANSFER			
11. There is a link between successful knowledge transfer and continuous improvement.	Q11	0.3878	0.7301
12. The application of quality tools and techniques contributes to knowledge transfer processes.	Q12	0.6131	0.6300
13. Creating an enabling environment is important for successful knowledge transfer.	Q13	0.5220	0.6500
14. A lack of knowledge transfer processes impacts negatively on the organisation's performance.	Q14	0.5956	0.6062
Cronbach's Coefficient Alpha for standardized variables			**0.7389**
Cronbach's Coefficient Alpha for raw variables			**0.7185**

The overall Cronbach Alpha Coefficient is greater than 0.70 thus this scale proves to be consistent. Note should be taken that some of the items in the scale have a Cronbach Alpha Coefficient of less than 0.70.

Table 5.8: Cronbach's Alpha Coefficient for each scale forming the measurement of the knowledge gap

Statements (Test all statements without current one's input)	Variable nr.	Correlation with total	Cronbach's Alpha Coefficient
KNOWLEDGE GAP BETWEEN UNIVERSITY AND INDUSTRY			
15. Industry is informed of Advisory Board meetings and their input is encouraged.	Q15	0.6109	0.6091
16. The outcome of the Advisory Board meeting is communicated to the relevant industries.	Q16	0.6797	0.5783
17. Industry is involved in curriculum reviews.	Q17	0.8186	0.5500
18. Mechanisms are in place to track a student's transition from University to industry.	Q18	0.4244	0.6765
19. Students know how to apply their knowledge in industry.	Q19	0.0864	0.7653
20. Employees create an opportunity for students to	Q20	0.0840	0.7541

Statements (Test all statements without current one's input)	Variable nr.	Correlation with total	Cronbach's Alpha Coefficient
apply their knowledge.			
Cronbach's Coefficient Alpha for standardized variables			**0.6865**
Cronbach's Coefficient Alpha for raw variables			**0.7099**

The result is that the Cronbach's Alpha Coefficients for each of the scales are more than 0.70 (the acceptable level according to Nunnally, 1978**:** 245), and thus these scales prove to be reliable and consistent. However, for some of the items the Cronbach Alpha Coefficients are less than 0.70. In most of these cases, if the items with the highest Cronbach Alpha Coefficient are deleted, the overall Cronbach Alpha Coefficient will increase, as well as the rest of the items in the scale. If the statement Q19 is deleted from this scale the overall Cronbach Alpha Coefficient will increase to 0.7653.

5.3.2 Descriptive Statistics

Table 5.9 shows the descriptive statistics for all the categorical variables with the frequencies in each category, and the percentage out of the total number of questionnaires for the staff questionnaire, and table 5.10 shows it for the industry questionnaire. Due to the fact that only 6 staff members completed the questionnaire, the response categories are aggregated, based on three response categories i.e.:

- Mostly – completely agree
- Undecided
- Mostly – completely disagree.

Take note that the descriptive statistics are based on the total sample. These descriptive statistics are also shown in Annexure B. Due to the extensive nature of Table 5.9, the table is contained within the ambit of Annexure F.

Due to the extensive nature of Table 5.10, the table is contained within the ambit of Annexure G.

Due to the extensive nature of Table 5.11, the table is contained within the ambit of Annexure H.

Due to the extensive nature of Table 5.12, the table is contained within the ambit of Annexure I.

5.3.3 Uni-Variate Graphs

This section will illustrate the distribution of the responses for each statement in the survey.

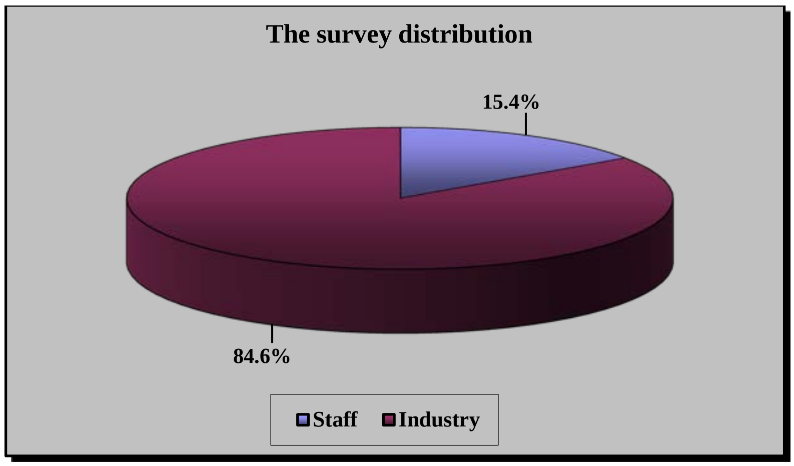


Figure 5.1: Survey distribution

As shown in Figure 5.1, of the 39 respondents who took part in the survey there were 15.4% respondents from the University and 84.6% respondents from the industry.

5.3.3.1 Staff survey

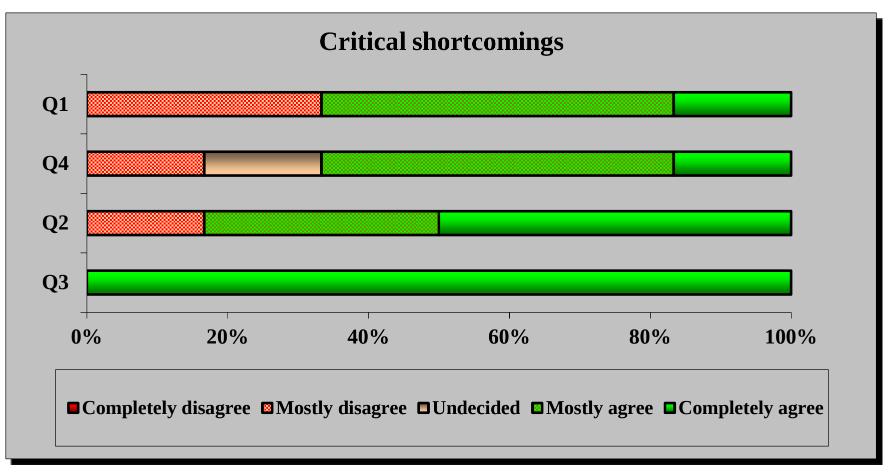


Figure 5.2: Critical shortcomings

Figure 5.2 illustrates how the statements were sorted from the statement where the respondents mostly, to completely agree with the statement to where the respondents least agree with the statement. The respondents mostly, to completely agree with the following statements:

- The department has a staff member who is known to industry who deals with industry related matters. (100.0% completely agree)
- The University has regular contact sessions with students in the industry. (83.3% mostly, to completely agree)
- Industry linkages are encouraged at University level and industry is informed of possible collaborations. (66.7% mostly, to completely agree)
- There is a lack of knowledge and expertise between University and industry. (66.7% mostly, to completely agree)

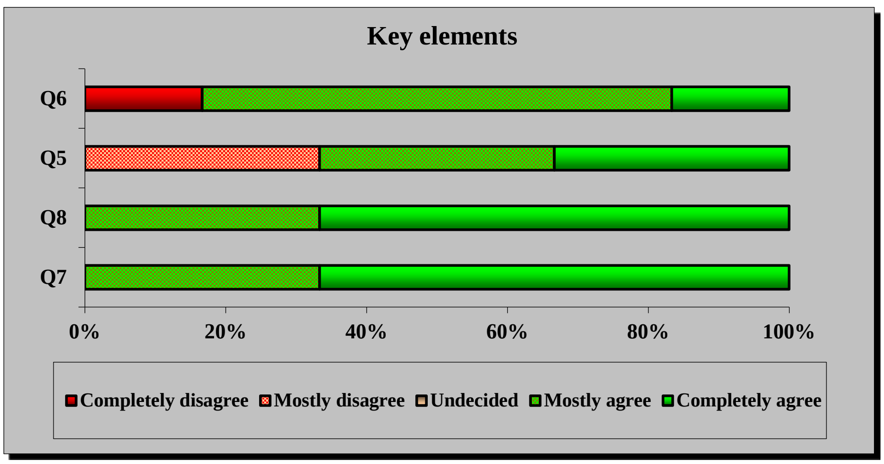


Figure 5.3: Key elements

Figure 5.3 illustrates how the statements were sorted from the statement where the respondents mostly, to completely agree with the statement to where they least agree with the statement. The respondents mostly, to completely agree with the following statements:

- Creating an enabling environment is important for successful knowledge transfer. (100.0% mostly, to completely agree)
- A lack of knowledge transfer processes impacts negatively on the organisation's performance. (100.0% mostly, to completely agree)
- There is a link between successful knowledge transfer and continuous improvement. (83.3% mostly, to completely agree)

➢ The application of quality tools and techniques contribute to knowledge transfer processes. (66.7% mostly, to completely agree)

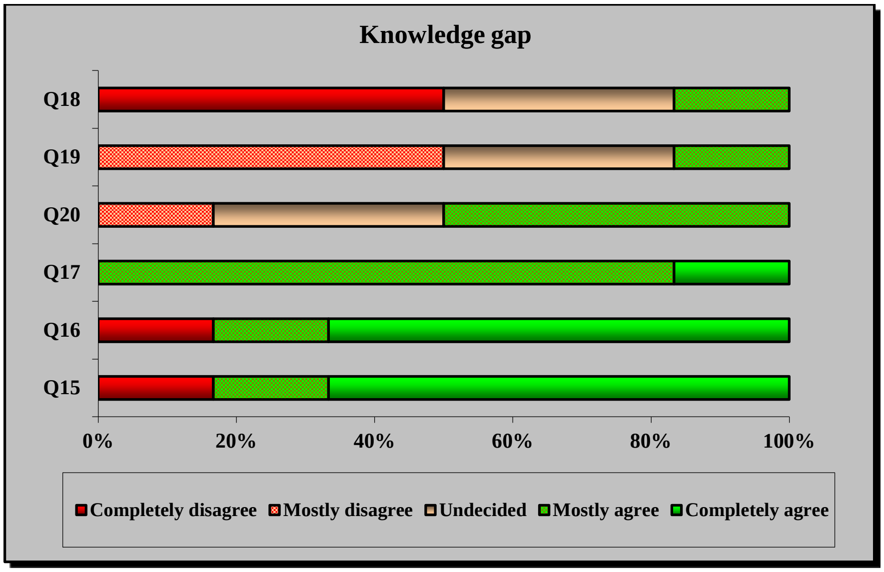


Figure 5.4: Knowledge gap

Figure 5.4 illustrates how the statements were sorted from the statement where the respondents mostly, to completely agree with the statement to where least agree with the statement. The respondents mostly, to completely agree with the following statements:

➢ Industry is informed of Advisory Board meetings and their input is encouraged. (83.3% mostly, to completely agree)

➢ The outcome of the Advisory Board meeting is communicated to the relevant industries. (83.3% mostly, to completely agree)

➢ Industry is involved in curriculum reviews. (100.0% mostly, to completely agree)

5.3.3.2 Industry survey

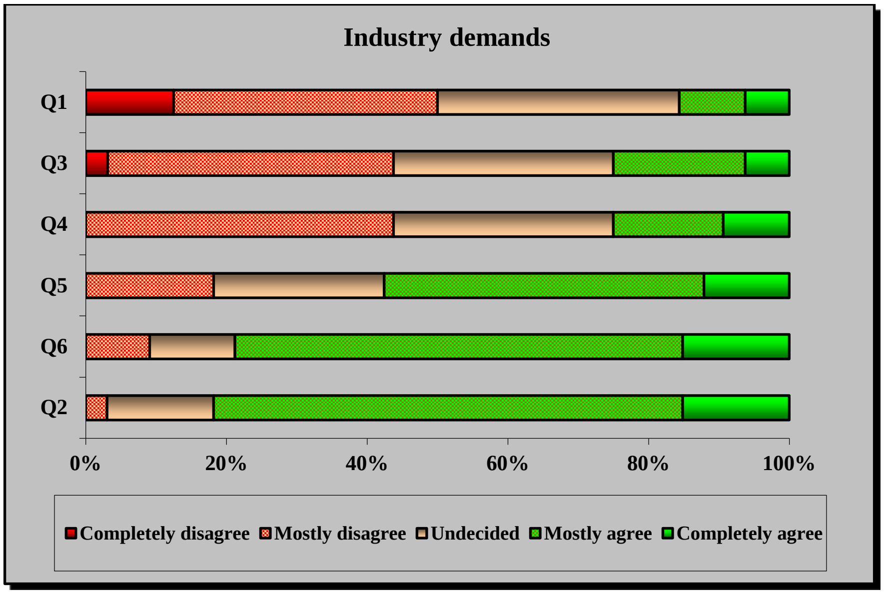


Figure 5.5: Industry demands

Figure 5.5 illustrates how the statements were sorted from the statement where the respondents mostly, to completely agree with the statement to where the respondents least agree with the statement. The respondents mostly, to completely agree with the following statements:

- Students are given the opportunity to apply their knowledge in industry. (81.8% completely agree)
- Students' knowledge can be used to improve processes and performance in the organisation. (78.8% mostly, to completely agree)

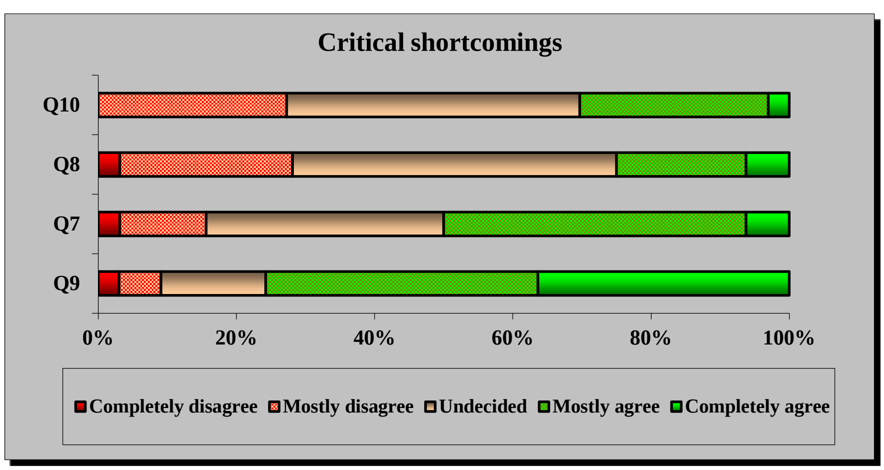


Figure 5.6: Critical shortcomings

Figure 5.6 illustrates how the statements were sorted from the statement where the respondents mostly, to completely agree with the statement to where the respondents least agree with the statement. The respondents mostly, to completely agree with the following statements:

- The department has a staff member that is known to industry that deals with industry related matters. (75.8% completely agree)

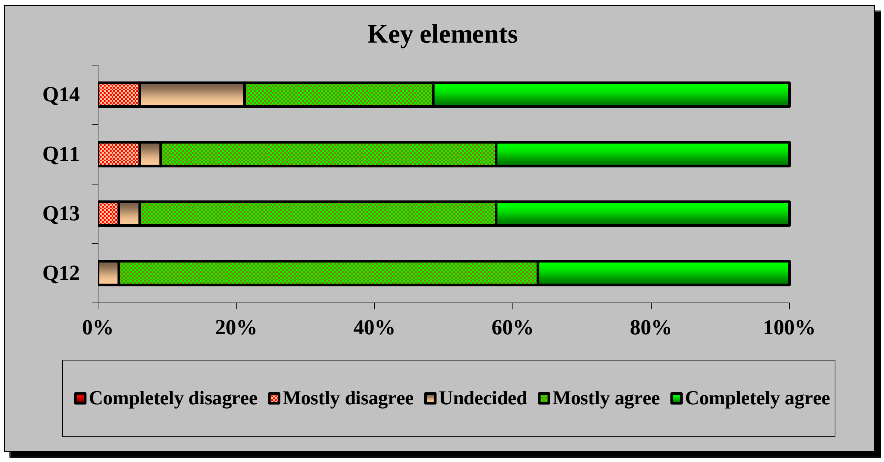


Figure 5.7: Key elements

Figure 5.7 illustrates how the statements were sorted from the statement where the respondents mostly, to completely agree with the statement to where they least agree with the statement. The respondents mostly, to completely agree with the following statements:

- The application of quality tools and techniques contribute to knowledge transfer processes. (97.0% mostly, to completely agree)
- Creating an enabling environment is important for successful knowledge transfer. (93.9% mostly, to completely agree)
- There is a link between successful knowledge transfer and continuous improvement. (90.9% mostly, to completely agree)
- A lack of knowledge transfer processes impacts negatively on the organisation's performance. (78.8% mostly, to completely agree)

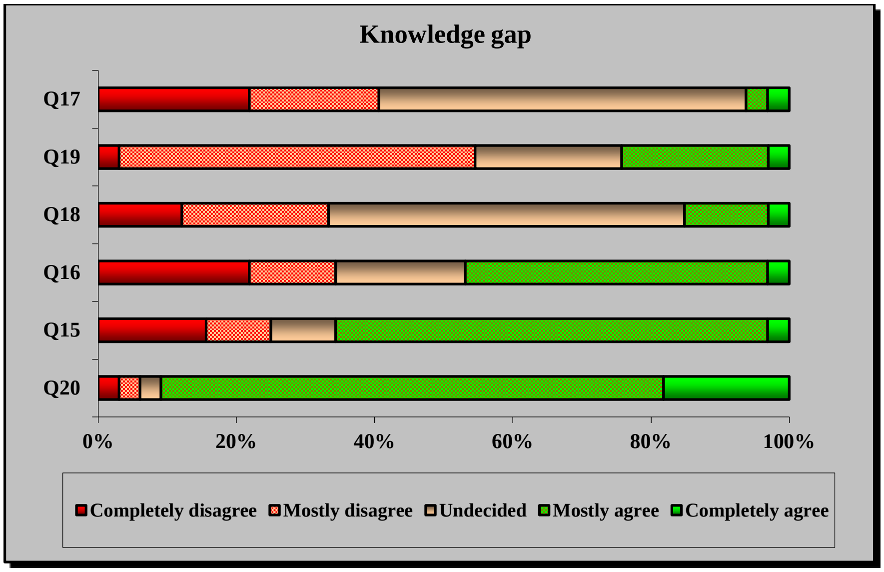


Figure 5.8: Critical shortcomings

Figure 5.8 illustrates how the statements were sorted from the statement where the respondents mostly, to completely agree with the statement to where the respondents least agree with the statement. The respondents mostly, to completely agree with the following statements:

- Employees create an opportunity for students to apply their knowledge. (90.9% mostly, to completely agree)
- Industry is informed of Advisory Board meetings and their input is encouraged. (65.6% mostly, to completely agree)

5.3.4 Inferential Statistics

The following inferential statistics will be performed on the survey data:

- For all the statements in the survey a comparison will be made between the proportions of respondents who mostly, to completely agree and the proportions of respondents who mostly, to completely disagree with the statements. This is done to serve as statistical evidence when the results are discussed.
- A comparison will be made between the responses of the staff of the university and the responses of the industry for the statements that were presented to them both.

Comparative statistics for abovementioned comparisons that were used are discussed in paragraph 5.3.4.1 and 5.3.4.2; and the computer printouts are shown in Annexure P, Q and R.

The hypotheses being tested for the comparisons under point 1 will be as follows:

- H_0 = The proportion of respondents who mostly, to completely agree is not different from the proportion of respondents who mostly, to completely disagree.
- H_1 = The proportion of respondents who mostly, to completely agree is different from the proportion of respondents who mostly, to completely disagree.

The hypotheses being tested for the comparisons under point 2 will be as follows:

- H_0 = The two independent groups (Staff and industry) do not differ with respect to their perceptions in this survey.
- H_1 = The two independent groups (Staff and industry) differ with respect to their perceptions in this survey.

5.3.4.1 Comparisons with regard to the difference in proportions of who agreed and who disagreed

Chi-square tests were performed to determine whether the proportion of respondents who agreed is equal to the proportion of respondents who disagreed for each question (statement). Due to the small number of staff respondents this test was not performed on the staff survey, but was performed on the industry survey. The results for only the statistically significant differences are shown in table 5.13; but all the results will be shown in Annexure P.

Table 5.13: Statistically significant Chi-square test for equal proportions for industry survey

Question / Statement	Sample Size	Chi-Square	DF	P-Value
INDUSTRY DEMANDS WITH RESPECT TO KNOWLEDGE TRANSFER FROM GRADUATE STUDENTS				
2. Students are given the opportunity to apply their knowledge in industry.	33	35.6364	2	<0.0001***
5. Student projects are practical and can be applied in industry.	33	8.9091	2	0.0116*
6. Students’ knowledge can be used to improve processes and performance in the organisation.	33	30.7273	2	<0.0001***

Question / Statement	Sample Size	Chi-Square	DF	P-Value
CRITICAL SHORTCOMINGS AT TERTIARY INSTITUTIONS				
9. The department has a staff member who is known to industry who deals with industry related matters.	33	26.9091	2	<0.0001***
KEY ELEMENTS WHICH ARE CRITICAL FOR SUCCESSFUL KNOWLEDGE TRANSFER				
11. There is a link between successful knowledge transfer and continuous improvement.	33	49.2727	2	<0.0001***
12. The application of quality tools and techniques contributes to knowledge transfer processes.	33	29.1212	2	<0.0001***
13. Creating an enabling environment is important for successful knowledge transfer.	33	54.5455	2	<0.0001***
14. A lack of knowledge transfer processes impacts negatively on the organisation's performance.	33	31.0909	2	<0.0001***
KNOWLEDGE GAP BETWEEN UNIVERSITY AND INDUSTRY				
15. Industry is informed of Advisory Board meetings and their input is encouraged.	32	16.1875	2	0.0003***
17. Industry is involved in curriculum reviews.	32	11.3125	2	0.0035**
18. Mechanisms are in place to track a student's transition from University to industry.	33	6.5455	2	0.0379*
19. Students know how to apply their knowledge in industry.	33	6.7273	2	0.0346*
20. Employees create an opportunity for students to apply their knowledge.	33	49.2727	2	<0.0001***

* *Statistically significant at level 0.05*

** *Statistically significant at level 0.01*

*** *Statistically significant at level 0.001*

Table 5.13 shows the statistically significant differences between the proportions of respondents who mostly, to completely agree, the proportions of the respondents who were undecided, and the proportions of the respondents who mostly, to completely disagree. In all of the above statements there were statistically significantly more respondents who mostly, to completely agreed than respondents in the other 2 groups, except for statement Q18 where there were statistically significantly more respondents that were undecided than respondents in the other groups, and for statement Q19 where there were statistically significantly more respondents who mostly, to completely disagreed than respondents in the other 2 groups. These differences can also be seen in figures 5.5-5.8.

5.3.4.2 Comparisons regarding whether the two independent groups differed in respect of their perceptions

A comparison is made between the two groups of respondents (Staff and industry) to see whether there is a difference in their perceptions in respect of the statements that were made. Firstly the two groups are compared in respect of each statement by using Chi-square tests, and then the 3 latent questions are compared by using the Mann-Whitney test for two samples, which compares the two means of the summarised variables CRIT, KEYE and KNOW, as doubt existed as to whether the data was normally distributed. The 3 latent variables consist of the following:

CRIT = Q7n+Q8n+Q9n+Q10n;

KEYE=Q11n+Q12n+Q13n+Q14n5; and

KNOW=+Q15n+Q16n+Q17n+Q18n+Q19n+Q20n.

All the statistically significant results will be discussed in this paragraph, but all the results, whether significant or not, can be found in Annexure R.

Table 5.14: Statistically significant Chi-square test for equal proportions between the staff and the industry

Question / Statement	Sample Size	Chi-Square	DF	P-value
8. The University has regular contact sessions with students in the industry.	38	8.0902	2	0.0175*
17. Industry is involved in curriculum reviews.	38	26.7188	2	<0.0001***
20. Employees create an opportunity for students to apply their knowledge.	38	7.5250	2	0.0232*

* *Statistically significant at level 0.05*

*** *Statistically significant at level 0.001*

As shown in Table 5.14, the staff of the University and the respondents from the industry differed statistically significantly in respect of:

- The University has regular contact sessions with students in the industry
- Industry is involved in curriculum reviews.
- Employees create an opportunity for students to apply their knowledge.

Table 5.15: Contingency table for Q8n versus the survey groups

Frequency / Row percentage	Mostly – Completely agree	Undecided	Mostly – Completely disagree	TOTAL
Staff	5 83.3%	0 0.0%	1 16.7%	6 15.8%
Industry	8 25.0%	15 46.9%	9 28.1%	32 84.2%
TOTAL	13 34.2%	15 39.5%	10 26.3%	38 100%

As shown in Table 5.15, there were statistically significantly more respondents from the staff who mostly to completely agree with the statement "The University has regular contact sessions with students in the industry" than respondents from the industry. Note should be taken that nearly half of the respondents from the industry were undecided as shown in Figure 5.9 below.

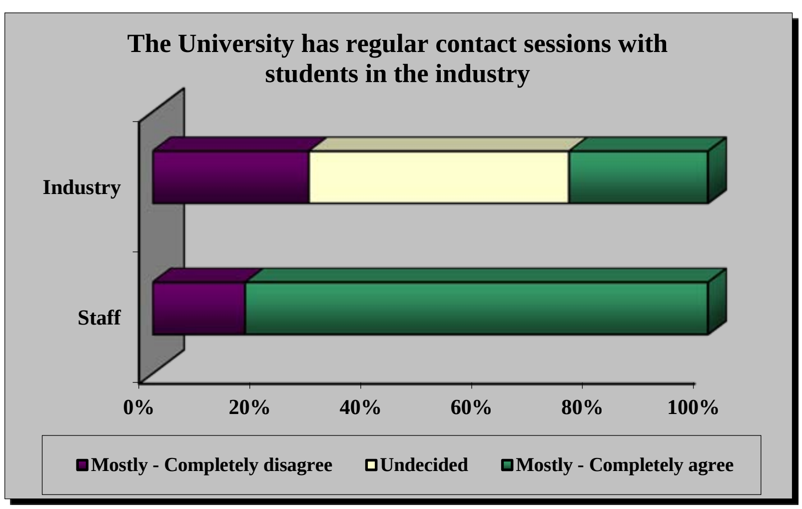


Figure 5.9: The University has regular contact sessions with students in the industry

Table 5.16: Contingency table for Q17n versus the survey groups

Frequency / Row percentage	Mostly – Completely agree	Undecided	Mostly – Completely disagree	TOTAL
Staff	6 100.0%	0 0.0%	0 0.0%	6 15.8%
Industry	2 6.2%	17 53.1%	13 40.6%	32 84.2%
TOTAL	8 21.0%	17 44.7%	13 34.2%	38 100%

As shown in Table 5.16 and illustrated in figure 5.10, statistically significantly more respondents from the staff mostly to completely agree with the statement "Industry is involved in curriculum reviews" than respondents from the industry.

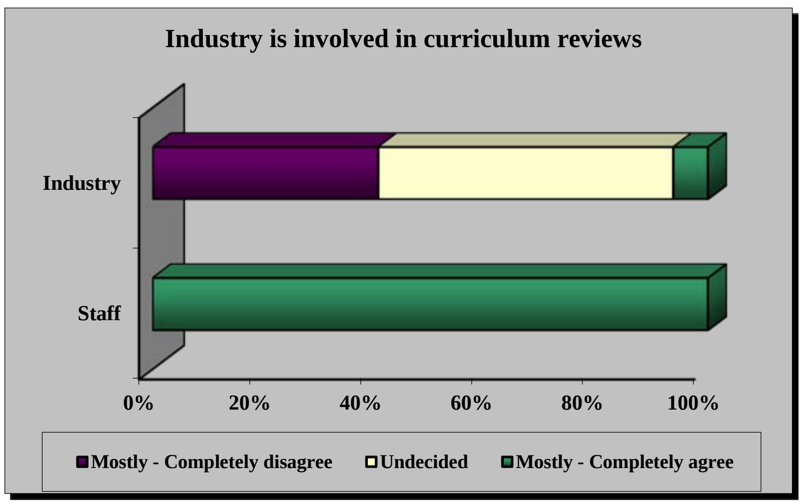


Figure 5.10: Industry is involved in curriculum reviews

Table 5.17: Contingency table for Q20n versus the survey groups

Frequency / Row percentage	Mostly – Completely agree	Undecided	Mostly – Completely disagree	TOTAL
Staff	3 50.0%	2 33.3%	1 16.7%	6 15.8%
Industry	29 90.6%	1 3.1%	2 6.3%	32 84.2%
TOTAL	32 84.2%	3 7.9%	3 7.9%	38 100%

As shown in Table 5.17 and illustrated in figure 5.11, statistically significantly more respondents from the industry, mostly to completely agree with the statement “Employees create an opportunity for students to apply their knowledge”, than respondents from the University.

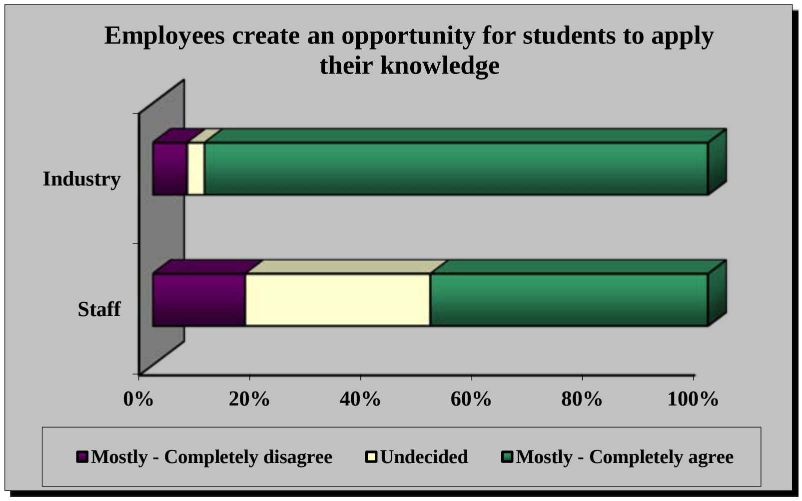


Figure 5.11: Employees create an opportunity for students to apply their knowledge

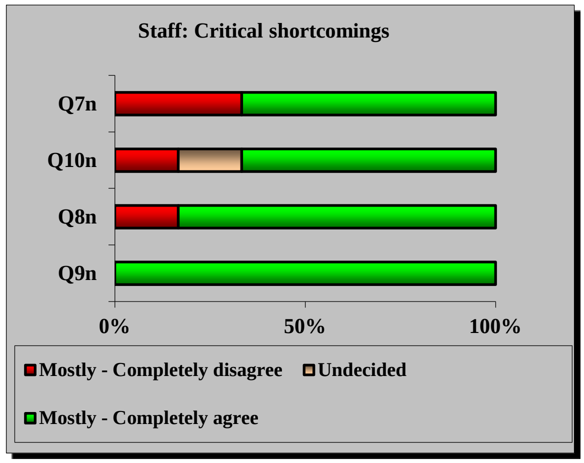
When the staff and industry were compared regarding their the latent variables, which are a combination of the statements, there were differences for the latent variable CRIT and represent the statements with respect to the critical shortcomings at University scale.

There is a statistically significant difference between the staff and industry survey groups in respect of “CRIT”. (Kruskal-Wallis statistic =.3741; DF=1; P-value=0.0038).

Table 5.18: Wilcoxon Scores (Rank Sums) for the SLA.

Survey groups	N	Sum of scores	Expected sum under H_0	Standard Deviation under H_0	Mean Score
Staff	6	45.5	117.0	24.7079	7.58
Industry	32	695.5	624.0	24.7079	21.73

As shown in Table 5.18, the H_0 hypothesis assumes that the 2 survey groups scored the “CRIT” factor the same way. The small P-value indicates a statistically significant difference in respect of the “CRIT” factor between the 2 survey groups because the H_0 is rejected. The staff has the lower mean score (7.58) which is an indication that the staff agreed more to the statements in the "CRIT" factor than the industry did. The higher the score the more the respondents disagreed, as 1 indicated 'completely agree' and 5 indicated 'completely disagree'. Illustrated in Figure 5.12 below, note should be taken that respondents from the industry were more undecided than the staff of the University.



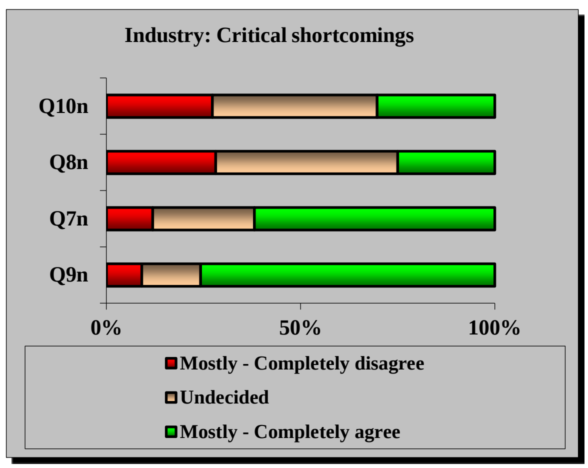


Figure 5.12: Critical shortcomings

CHAPTER 6: CONCLUSION AND RECOMMENDATIONS

6.1 THE RESEARCH THUS FAR

In chapter one, the scope of the research was given and elaborated upon. In Chapter two, a holistic perspective of the background to the research problem was provided. In Chapter three the literature review was conducted on the different aspects of knowledge transfer and the importance of proper knowledge transfer from University to industry. In chapter four the survey environment and target population were given, and the analysis of date obtained from the survey was presented. In this chapter the final conclusion and recommendations will be made to mitigate the research problem.

6.2 ANALOGIES DRAWN FROM THE DATA ANALYSIS

As for the results obtained through the survey on mechanisms that can be implemented by Universities to narrow the gap between University knowledge and industry requirements, the following analogies can be drawn:

- Both the staff of the University, as well as the industry, have the perception, when it comes to critical shortcomings, that the department has a staff member who is known to the industry, and deals with industry related matters. However, the staff of the University seems to be more positive than the industry, of the fact that the University has regular contact sessions with students in the industry.
- The staff of the University, as well as the industry, have the perception, regarding key elements that are critical for the success of knowledge transfer, that:
  - Creating an enabling environment is important for successful knowledge transfer.
  - A lack of knowledge transfer processes impacts negatively on the organisation’s performance.

- There is a link between successful knowledge transfer and continuous improvement. The application of quality tools and techniques contribute to knowledge transfer processes.

- However, note should be taken that the industry respondents felt more positive toward the statement ‘The application of quality tools and techniques contribute to knowledge transfer processes’, than the staff of the University.
- The perception of the staff of the University as well as of the industry, with regard to the knowledge gap between University and the industry, are both positive, for the statement “Industry is informed of Advisory Board meetings, and their input is encouraged”. However, the industry was not as positive as the staff of the University.
- The staff of the university also felt that the industry is involved in curriculum reviews, but the industry was more undecided on this statement.
- The industry felt positive that the employees create an opportunity for students to apply their knowledge, whilst the staff of the University did not feel as positive about this statement.
- The industry also felt, concerning industry demands, that:
  - Students are given the opportunity to apply their knowledge in industry.
  - Student projects are practical and can be applied in the industry.
  - Students’ knowledge can be used to improve processes and performance in the organisation.
- Overall the staff of the University was more positive concerning the critical outcome statements, below, than the Industry:
  - The outcome of the Advisory Board meetings is communicated to the relevant industries
  - Industry is involved in curriculum reviews

6.3 ANALOGIES DRAWN FROM THE LITERATURE REVIEW

Gordon (2000:71-79) states that there is little doubt that knowledge is a complex concept that has occupied the thoughts of philosophers and others for hundreds (thousands) of years. The author further states that it is not surprising that the current thoughts on knowledge management, and efforts to establish such ideas in business and industry, can be difficult or inappropriate.

It is clear that knowledge plays a key role in the information revolution, and that major challenges are to select the “right” information from numerous sources and transform it into useful knowledge, (Smith, 2001:311-321). Rossi (2010:155-171), observed that researchers in certain fields are particularly active in knowledge transfer, and that the determinants of the intensity of knowledge transfer activities are generally specific to particular research areas.

Top management commitment is a very crucial aspect of the quality process and the transfer of knowledge in the organisation. Although Dalgleish (2002:56), strongly agrees with Deming that top management support is critical to any quality improvement campaign, he also states that in most cases, blaming top management is nothing more than a self victimizing excuse to do nothing to change what frustrates most quality professionals. It is therefore possible that blame can be passed from one entity to another. Misunderstanding can also lead to greater confusion amongst workers and management, as well as between industry and the university.

6.3.1 Transfer from University to Industry

Agrawal (2001:297), explored the characteristics of the various channels through which knowledge is transferred from the university to industry. The author states that the channels of transfer between university and industry include publications, patents, consulting, informal meetings, recruiting, licensing, joint ventures, research contracts, and personal exchange.

The transfer of knowledge can be perceived in different ways. Who is responsible for knowledge transfer? Harrington and Kearney (2010:121), state that the lack of knowledge transfer relates to the self-referential nature of different social systems inhabited by researchers and management practitioners. They further argue that researchers and management practitioners fail to imagine scenarios other than those of the traditional classroom, and the existing systems of academics publishing in refereed journals.

Geuna and Muscio (2009:93), are of the opinion that universities have long been involved in knowledge transfer activities. Yet the last 30 years have seen major changes in the governance of university–industry interactions.

6.3.2 Knowledge required by industry

In general, there is a specific focus at universities and in industry, on knowledge transfer and how it impacts on certain processes, and the application of knowledge in different fields. The importance of different channels of university-industry knowledge transfer can be differently assessed by firms active in different industries. After all, firms active in different industries make use of different technological and market knowledge (Bekkers & Freitas, 2008:1837).

To explain the knowledge requirement of production in industry, Grant (1996:112), makes the following statement: "Production involves the transformation of inputs into outputs. Fundamental to a knowledge-based theory of the firm is the assumption that the critical input in production and primary source of value is knowledge. Indeed, if we were to resurrect a single-factor theory of value in the tradition of the classical economists' labour theory of value, or the French Physiocrats land-based theory of value, then the only defensible approach would be a knowledge-based theory of value, on the grounds that all human productivity is knowledge dependent, and machines are simply embodiments of knowledge".

6.3.3 Channels of transfer

McNamee, Schoch, Oelschlaeger and Huskey (2000:**Online**), mention three components in successful knowledge exchange: find, engage and understand. They argue that people must find one another, or somehow recognize the potential for collaboration; both potential participants must be motivated to some minimal engagement level. The interaction between industry and university should therefore become the focus point. Advisory Board meetings could be used as a platform to encourage interaction.

In order for knowledge to be transferred effectively, there needs to be a fit between individual readiness to transfer knowledge and organizational receptivity to knowledge (Lazarova & Tarique, 2005:369).

6.4 THE RESEARCH PROBLEM REVISITED

The research problem, which was formulated in Chapter 1, reads as follows: “Academic knowledge gleaned at University does not meet the requirements of industry”

From the results of the survey it is clear that industry and university have different perceptions of knowledge transfer. Staff members in the Department of Industrial and Systems Engineering believe that there are regular contact sessions with students in industry. Although industry agrees that there is a staff member who deals with industry related matters, they are not very positive that there are regular contact sessions with students in industry. Staff in the Department of Industrial and Systems Engineering, as well as industry, agree that creating an enabling environment is important for successful knowledge transfer, and that there is a link between successful knowledge transfer and continuous improvement.

The different perceptions of staff and industry could be because of different experiences i.e. students' ability to apply knowledge in industry, or students' academic performance. Although staff felt that industry is involved in curriculum reviews, the industry was undecided on their involvement in curriculum reviews. Industry was very positive about the opportunities that they create for students to apply their knowledge. Industry also mostly agreed that students' projects are practical and can be applied in industry, and that students' knowledge can be used to improve processes and performance in the organization. With these positive responses, the interaction should be encouraged and exchange of information between the department and industry should definitely be taken to the curriculum review stage. Students' practical projects could be developed and used as social development / community engagement projects.

Industry was very positive that quality tools and techniques contribute to knowledge transfer processes. Staff was not as positive, which again proves that communication channels between university and industry need to improve and should be embarked upon as soon as possible.

6.5 THE RESEARCH QUESTION REVISITED

The research question, which was formulated in Chapter 1, reads as follows: "What mechanism can be implemented by tertiary institutions to narrow the gap between University knowledge and industry requirements?"

6.5.1 Advisory Board

The importance of a functional Advisory Board could not be stressed more. It is absolutely imperative that the Advisory Board should meet on a regular basis, and that it should include more members from industry. Industry was not very positive about being informed of Advisory Board meetings, and their input being encouraged. Industry should be encouraged to actively participate as members of the Board and they should be part of the curriculum review process. Sub-committees in the Advisory Board should be formed where people with specific skills could focus on areas such as curriculum reviews, developing partnerships and improving industry linkages. Expectations from both entities need to be discussed in Advisory Board meetings. Feedback to those members who are not on the Board is crucial in order to determine and monitor progress, as well as developing other needs that may arise.

Input and guidance are the key words for both University and industry, in order to create a successful knowledge transfer modem, which benefits both entities. The knowledge transfer "modem" would ultimately be the student, and University and industry should start realizing the importance of the student.

6.5.2 Sharing of knowledge and expertise

Staff, as well as industry agreed that creating an enabling environment is important for successful knowledge transfer. In order to create an enabling environment, there must be interaction between University and industry. Through regular communication and structured plans of interaction, opportunities for students can be created which will create an enabling environment on which both entities can thrive, and it could, at the same time, improve their social responsibility.

The student is the most important link between the transfer process and industry, as "receiving" entity, and should be clear on what their needs are. Sharing these needs could bridge the gap. Some needs could be assumed to be trivial and therefore would not receive the necessary attention. In Chapter 2, figure 2.3, it shows the student as an output and input "modem". Sharing knowledge and expertise from industry is crucial, in order for universities to know what should be taught as "output", in order to feed the right "input".

Exchange between staff from University and staff in industry is an important factor, and should be explored and acted upon. Other means of knowledge sharing, like exchange programmes between lecturers and employees in industry, should also be looked at. The important factor should be equipping the student with the correct tools and knowledge to ensure faultless quality processes and continuous improvement in industry.

6.5.3 Misconception of knowledge transfer

From the research results it is evident that the perceptions of staff and industry are diverse. Linkages and collaborations between University and industry would keep communication channels open, and any misconception of the knowledge transfer process should be addressed. Expectations from both entities needs attention

Communication is a two-way operation, and staff and industry members should be actively involved in addressing pressing issues that are hampering proper knowledge transfer to and from the students. Based on the results, the gap between University and industry stems from the misconception of knowledge transfer and the inability to take responsibility for committing to collaboration.

The Department of Industrial and Systems Engineering should make a concerted effort in identifying industry partners and assigning staff members to interact with industry. In Chapter 2, figure 2.4 illustrates the link between university and industry. University and industry have different resources which should be shared to narrow the gap. Industry has to be involved in curriculum reviews and development.

6.6 KEY RESEARCH OBJECTIVES REVISITED

The research objectives, which were formulated in chapter 1, read as follows:

- To determine the demands from industry in respect of knowledge transfer from graduate students.
- To determine the shortcomings at tertiary institutions in respect of knowledge transfer to students and thereafter to industry.

- To determine which elements are critical for successful knowledge transfer.
- To formulate an approach for industry to close the gap created by the demands of the knowledge gap
- To ascertain whether a structured mechanism can be implemented by the University to narrow the gap between University knowledge and industry requirements?

6.6.1 To determine the demands from industry in respect of knowledge transfer from graduate students.

Based on the results of the questionnaire, industry mostly disagreed with, or was undecided about the statement that they should inform the university what is expected in industry. If they do not inform the University, it could be that Advisory Board meetings are not held regularly and/or other means of communication are not clear to industry.

6.6.2 To determine the shortcomings at tertiary institutions in respect of knowledge transfer to students, and thereafter to industry.

From the data obtained in the survey, the diverse perceptions of staff and industry make it clear that the lack of communication and collaboration are the biggest shortcomings of knowledge transfer, and how it addresses what is required by industry.

6.6.3 To determine which elements are critical for successful knowledge transfer.

Based on the results of the survey, University staff mostly agreed that industry linkages are encouraged, and that industry is informed of possible collaboration. However, industry is undecided about this statement. The disparity between

University and industry is of concern and points to a lack of communication and commitment on both sides.

6.6.4 To formulate an approach for industry to close the gap created by the demands of the knowledge gap

Based on the results of the survey, industry has lucid concerns with regard to commitment from University. Industry mostly disagreed, or was undecided when it came to the lack of sharing of knowledge and expertise between University and industry. Industry has to realize that they have to play an active role in the knowledge transfer process. The importance of their role and how collaborations should be done, need to be communicated and acted upon. An approach for industry would be to propose practical projects and to assist with the mentoring, assessment and/or moderation of these projects. Active involvement in the curriculum development and review process should come from a task team in industry. The Department of Industrial and Systems Engineering should, however, communicate the role industry plays, to industry, and clear communication channels and contacts should be communicated.

6.6.5 To ascertain whether a structured mechanism can be implemented by the University to narrow the gap between University knowledge and industry requirements?

In Chapter 2, Figure 2.2 shows the important activities that link university and industry. Each activity should be addressed in the Advisory Board meetings in order to narrow the gap between University knowledge and industry requirements. Where Figure 2.2 shows these activities as links between University and industry, the following model shows the activities as core functions of the Advisory Board:

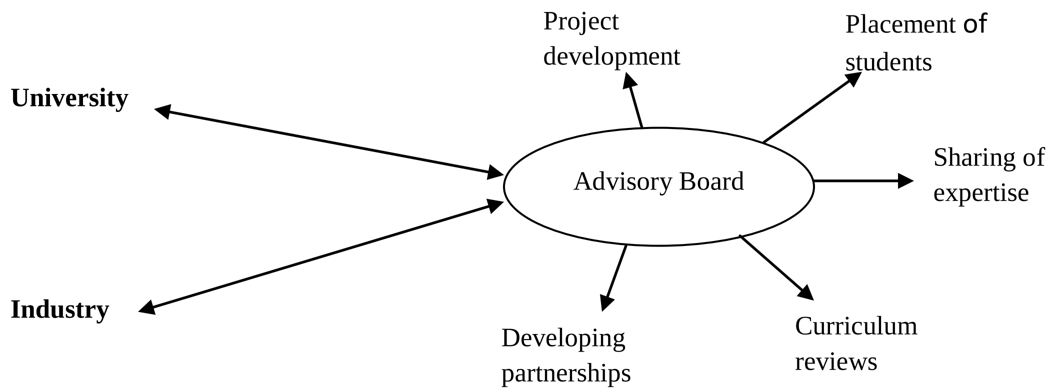


Figure 6.1: Core functions of the Advisory Board (**Source**: Own)

The value of the Advisory Board is underestimated. Board meetings should be optimally used and the above mentioned core functions should be driven, developed and used, to boost interaction between University and industry and to narrow the knowledge transfer gap. The most important "commodity" is the student, therefore implementation processes should start as soon as possible.

6.7 FINAL CONCLUSION

The research was conducted in the Department of Industrial and Systems Engineering and the Industrial Engineering industry. It is hoped that the questionnaires were completed accurately and honestly.

It is also hoped that, from this study, university – industry collaboration will become an integral part of the Department of Industrial and Systems Engineering's strategic plan and that the Advisory Board will be used to full capacity, in order to narrow the gap between University knowledge and industry requirements.

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Annexure A:

QUESTIONNAIRE: Industry

INDUSTRY DEMANDS WITH RESPECT TO KNOWLEDGE TRANSFER FROM GRADUATE STUDENTS						
		Completely agree	Mostly agree	Undecided	Mostly disagree	Completely disagree
1	Your organisation informs the University of what is expected in industry	1	2	3	4	5
2	Students are given the opportunity to apply their knowledge in industry	1	2	3	4	5
3	The organisation communicate shortcomings in students' knowledge and knowledge transfer abilities to the University	1	2	3	4	5
4	Regular discussions with the University with regard to student projects are held	1	2	3	4	5
5	Student projects are practical and can be applied in industry	1	2	3	4	5
6	Students' knowledge can be used to improve processes and performance in the organisation	1	2	3	4	5
CRITICAL SHORTCOMINGS AT TERTIARY INSTITUTIONS						
7	There is a lack of sharing of knowledge and expertise between University and industry	1	2	3	4	5
8	The University has regular contact sessions with students in industry (could be in the form of surveys or interviews)	1	2	3	4	5
9	The Department has a staff member, that is known to industry, that deals with industry related matters i.e. student placements and progress	1	2	3	4	5
10	Industry linkages are encouraged at University level and industry is informed of possible collaborations	1	2	3	4	5
KEY ELEMENTS WHICH ARE CRITICAL FOR SUCCESSFUL KNOWLEDGE TRANSFER						
11	There is a link between successful knowledge transfer and continuous improvement	1	2	3	4	5
12	The application of quality tools and techniques contribute to knowledge transfer processes	1	2	3	4	5

13	Creating an enabling environment is important for successful knowledge transfer	1	2	3	4	5
14	A lack of knowledge transfer processes impacts negatively on the organisation’s performance	1	2	3	4	5
KNOWLEDGE GAP BETWEEN TERTIARY INSTITUTIONS AND INDUSTRY						
		Comple	**Mostly**	**Undeci**	**Mostly**	**Comple**
15	Industry is informed of Advisory Board meetings and their input is encouraged	1	2	3	4	5
16	The outcome of the Advisory Board meeting is communicated to the relevant industries	1	2	3	4	5
17	Industry is involved in curriculum reviews	1	2	3	4	5
18	Mechanisms are in place to track a student’s transition from University to industry	1	2	3	4	5
19	Students know how to apply their knowledge in industry	1	2	3	4	5
20	Employers create an opportunity for students to apply their knowledge	1	2	3	4	5

Annexure B:

QUESTIONNAIRE: Staff

CRITICAL SHORTCOMINGS AT TERTIARY INSTITUTIONS						
		Completely agree	**Mostly agree**	**Undecided**	**Mostly disagree**	**Completely disagree**
1	There is a lack of sharing of knowledge and expertise between University and industry	1	2	3	4	5
2	The University has regular contact sessions with students in industry (could be in the form of surveys or interviews)	1	2	3	4	5
3	The Department has a staff member, that is known to industry, that deals with industry related matters i.e. student placements and progress	1	2	3	4	5
4	Industry linkages are encouraged at University level and industry is informed of possible collaborations	1	2	3	4	5
KEY ELEMENTS WHICH ARE CRITICAL FOR SUCCESSFUL KNOWLEDGE TRANSFER						
5	There is a link between successful knowledge transfer and continuous improvement	1	2	3	4	5
6	The application of quality tools and techniques contribute to knowledge transfer processes	1	2	3	4	5
7	Creating an enabling environment is important for successful knowledge transfer	1	2	3	4	5
8	A lack of knowledge transfer processes impacts negatively on the organisation’s performance	1	2	3	4	5
KNOWLEDGE GAP BETWEEN TERTIARY INSTITUTIONS AND INDUSTRY						
9	Industry is informed of Advisory Board meetings and their input is encouraged	1	2	3	4	5
10	The outcome of the Advisory Board meeting is communicated to the relevant industries	1	2	3	4	5
11	Industry is involved in curriculum reviews	1	2	3	4	5
12	Mechanisms are in place to track a student’s transition from University to industry	1	2	3	4	5
13	Students know how to apply their knowledge in industry	1	2	3	4	5
14	Employers create an opportunity for students to apply their knowledge	1	2	3	4	5

Annexure C:

Table 5.2: Cronbach's Alpha Coefficient for all the items forming the measuring instrument in the staff sample

Statements (Test all statements without current one's input)	**Variable nr.**	**Correlation with total**	**Cronbach's Alpha Coefficient**
CRITICAL SHORTCOMINGS AT TERTIARY INSTITUTIONS			
1. There is a lack of knowledge and expertise between University and industry.	Q1	-0.4392	0.7941
2. The University has regular contact sessions with students in the industry.	Q2	-0.0127	0.7418
3. The department has a staff member that is known to industry that deals with industry related matters.	Q3		
4. Industry linkages are encouraged at University level and industry is informed of possible collaborations.	Q4	0.6704	0.6542
KEY ELEMENTS WHICH ARE CRITICAL FOR SUCCESSFUL KNOWLEDGE TRANSFER			
5. There is a link between successful knowledge transfer and continuous improvement.	Q5	0.1824	0.7220
6. The application of quality tools and techniques contribute to knowledge transfer processes.	Q6	0.5123	0.6687
7. Creating an enabling environment is important for successful knowledge transfer.	Q7	-0.1132	0.7288
8. A lack of knowledge transfer processes impacts negatively on the organisation's performance.	Q8	0.0574	0.7193
KNOWLEDGE GAP BETWEEN TERTIARY INSTITUTIONS AND INDUSTRY			
15. Industry is informed of Advisory Board meetings and their input is encouraged.	Q15	0.9035	0.5808
16. The outcome of the Advisory Board meeting is communicated to the relevant industries.	Q16	0.9704	0.5857

Statements (Test all statements without current one's input)	**Variable nr.**	**Correlation with total**	**Cronbach's Alpha Coefficient**
17. Industry is involved in curriculum reviews.	Q17	0.1089	0.7161
18. Mechanisms are in place to track a student's transition from University to industry.	Q18	0.4570	0.6783
19. Students know how to apply their knowledge in industry.	Q19	0.5839	0.6740
20. Employees create an opportunity for students to apply their knowledge.	Q20	0.5561	0.6768
Cronbach's Coefficient Alpha for standardized variables			**0.6801**
Cronbach's Coefficient Alpha for raw variables			**0.7134**

Annexure D:

Table 5.3: Cronbach's Alpha Coefficient for all the items forming the measuring instrument in the staff sample deleting Q1 from the sample

Statements (Test all statements without current one's input)	Variable nr.	Correlation with total	Cronbach's Alpha Coefficient
CRITICAL SHORTCOMINGS AT UNIVERSITY			
2. The University has regular contact sessions with students in the industry.	Q2	-0.0000	0.8221
4. Industry linkages are encouraged at University level and industry is informed of possible collaborations.	Q4	0.6194	0.7623
KEY ELEMENTS WHICH ARE CRITICAL FOR SUCCESSFUL KNOWLEDGE TRANSFER			
5. There is a link between successful knowledge transfer and continuous improvement.	Q5	0.2366	0.8046
6. The application of quality tools and techniques contribute to knowledge transfer processes.	Q6	0.4975	0.7736
7. Creating an enabling environment is important for successful knowledge transfer.	Q7	-0.0000	0.8048
8. A lack of knowledge transfer processes impacts negatively on the organisation's performance.	Q8	0.1079	0.8003
KNOWLEDGE GAP BETWEEN UNIVERSITY AND INDUSTRY			
15. Industry is informed of Advisory Board meetings and their input is encouraged.	Q15	0.8830	0.7159
16. The outcome of the Advisory Board meeting is communicated to the relevant industries.	Q16	0.9583	0.7127
17. Industry is involved in curriculum reviews.	Q17	0.0679	0.8010
18. Mechanisms are in place to track a student's transition from University to industry.	Q18	0.5889	0.7621
19. Students know how to apply their knowledge in industry.	Q19	0.5810	0.7704

Statements (Test all statements without current one's input)	Variable nr.	Correlation with total	Cronbach's Alpha Coefficient
20. Employees create an opportunity for students to apply their knowledge.	Q20	0.5167	0.7752
Cronbach's Coefficient Alpha for standardized variables			**0.7607**
Cronbach's Coefficient Alpha for raw variables			**0.7941**

Annexure E:

Table 5.5: Cronbach's Alpha Coefficient for each scale forming the measurement of the industry sample

Statements (Test all statements without current one's input)	Variable nr.	Correlation with total	Cronbach's Alpha Coefficient
INDUSTRY DEMANDS WITH RESPECT TO KNOWLEDGE TRANSFER FROM GRADUATE STUDENTS			
1. Your organisation informs the University of what is expected in industry.	Q1	0.3777	0.7420
2. Students are given the opportunity to apply their knowledge in industry.	Q2	0.3230	0.7476
3. The organisation communicates shortcomings in students' knowledge and knowledge transfer abilities to the University.	Q3	0.6264	0.7217
4. Regular discussions with the University with regard to student projects are held.	Q4	0.3919	0.7410
5. Student projects are practical and can be applied in industry.	Q5	0.4813	0.7343
6. Students' knowledge can be used to improve processes and performance in the organisation.	Q6	0.2023	0.7543
CRITICAL SHORTCOMINGS AT UNIVERSITY			
7. There is a lack of sharing of knowledge and expertise between University and industry.	Q7	0.0506	0.7655
8. The University has regular contact sessions with students in the industry.	Q8	0.3885	0.7416
9. The department has a staff member that is known to industry that deals with industry related matters.	Q9	0.3536	0.7440
10. Industry linkages are encouraged at University level and industry is informed of possible collaborations.	Q10	0.4849	0.7356
KEY ELEMENTS WHICH ARE CRITICAL FOR SUCCESSFUL KNOWLEDGE TRANSFER			

Statements (Test all statements without current one's input)	Variable nr.	Correlation with total	Cronbach's Alpha Coefficient
11. There is a link between successful knowledge transfer and continuous improvement.	Q11	0.4046	0.7414
12. The application of quality tools and techniques contribute to knowledge transfer processes.	Q12	0.4100	0.7450
13. Creating an enabling environment is important for successful knowledge transfer.	Q13	0.1413	0.7572
14. A lack of knowledge transfer processes impacts negatively on the organisation's performance.	Q14	0.3127	0.7472
KNOWLEDGE GAP BETWEEN UNIVERSITY AND INDUSTRY			
15. Industry is informed of Advisory Board meetings and their input is encouraged.	Q15	0.1978	0.7591
16. The outcome of the Advisory Board meeting is communicated to the relevant industries.	Q16	0.2071	0.7595
17. Industry is involved in curriculum reviews.	Q17	0.3781	0.7421
18. Mechanisms are in place to track a student's transition from University to industry.	Q18	0.3816	0.7421
19. Students know how to apply their knowledge in industry.	Q19	0.2752	0.7501
20. Employees create an opportunity for students to apply their knowledge.	Q20	0.1094	0.7600
Cronbach's Coefficient Alpha for standardized variables			**0.7657**
Cronbach's Coefficient Alpha for raw variables			**0.7565**

Annexure F:

Table 5.9: Descriptive statistics for all the variables of the staff questionnaire

Variables	Categories	Frequency	Percentage out of total
CRITICAL SHORTCOMINGS AT UNIVERSITY			
1. There is a lack of knowledge and expertise between University and industry.	Mostly - Completely agree	4	66.7%
	Undecided	0	0.0%
	Mostly - Completely disagree	2	33.3%
2. The University has regular contact sessions with students in the industry.	Mostly - Completely agree	5	83.3%
	Undecided	0	0.0%
	Mostly - Completely disagree	1	16.7%
3. The department has a staff member that is known to industry that deals with industry related matters.	Mostly - Completely agree	6	100.0%
	Undecided	0	0.0%
	Mostly - Completely disagree	0	0.0%
4. Industry linkages are encouraged at University level and industry is informed of possible collaborations.	Mostly - Completely agree	4	66.7%
	Undecided	1	16.7%
	Mostly - Completely disagree	1	16.7%
KEY ELEMENTS WHICH ARE CRITICAL FOR SUCCESSFUL KNOWLEDGE TRANSFER			
5. There is a link between successful knowledge transfer and continuous improvement.	Mostly - Completely agree	4	66.7%
	Undecided	0	0.0%
	Mostly - Completely disagree	2	33.3%
6. The application of quality tools and techniques contribute to knowledge	Mostly - Completely agree	5	83.3%

Variables	Categories	Frequency	Percentage out of total
transfer processes.	Undecided	0	0.0%
	Mostly - Completely disagree	1	16.7%
7. Creating an enabling environment is important for successful knowledge transfer.	Mostly - Completely agree	6	100.0%
	Undecided	0	0.0%
	Mostly - Completely disagree	0	0.0%
8. A lack of knowledge transfer processes impacts negatively on the organisation's performance.	Mostly - Completely agree	6	100.0%
	Undecided	0	0.0%
	Mostly - Completely disagree	0	0.0%
KNOWLEDGE GAP BETWEEN TERTIARY INSTITUTIONS AND INDUSTRY			
15. Industry is informed of Advisory Board meetings and their input is encouraged.	Mostly - Completely agree	5	83.3%
	Undecided	0	0.0%
	Mostly - Completely disagree	1	16.7%
16. The outcome of the Advisory Board meeting is communicated to the relevant industries.	Mostly - Completely agree	4	66.7%
	Undecided	0	0.0%
	Mostly - Completely disagree	2	33.3%
17. Industry is involved in curriculum reviews.	Mostly - Completely agree	6	100.0%
	Undecided	0	0.0%
	Mostly - Completely disagree	0	0.0%
18. Mechanisms are in place to track a student's transition from University to industry.	Mostly - Completely agree	1	16.7%
	Undecided	2	33.3%

Variables	Categories	Frequency	Percentage out of total
	Mostly - Completely disagree	3	50.0%
19. Students know how to apply their knowledge in industry.	Mostly - Completely agree	1	16.7%
	Undecided	2	33.3%
	Mostly - Completely disagree	3	50.0%
20. Employees create an opportunity for students to apply their knowledge.	Mostly - Completely agree	3	50.0%
	Undecided	2	33.3%
	Mostly - Completely disagree	1	16.7%

Annexure G:

Table 5.10: Descriptive statistics for all the variables of the industry questionnaire

Variables	Categories	Frequency	Percentage out of total
INDUSTRY DEMANDS WITH RESPECT TO KNOWLEDGE TRANSFER FROM GRADUATE STUDENTS			
1. Your organisation informs the University of what is expected in industry.	Completely agree	2	%
	Mostly agree	3	%
	Undecided	11	%
	Mostly disagree	12	%
	Completely disagree	4	%
	Unknown	1	3.0%
2. Students are given the opportunity to apply their knowledge in industry.	Completely agree	5	15.2%
	Mostly agree	22	66.7%
	Undecided	5	15.2%
	Mostly disagree	1	3.0%
	Completely disagree	0	0.0%
3. The organisation communicates shortcomings in students' knowledge and knowledge transfer abilities to the University.	Completely agree	2	6.1%
	Mostly agree	6	18.2%
	Undecided	10	30.3%
	Mostly disagree	13	39.4%
	Completely disagree	1	3.0%
	Unknown	1	3.0%
4. Regular discussions with the University with regard to student projects are held.	Completely agree	3	19.1%
	Mostly agree	5	15.2%
	Undecided	10	30.3%
	Mostly disagree	14	42.4%
	Completely disagree	0	0.0%
	Unknown	1	3.0%
5. Student projects are practical and can be applied in industry.	Completely agree	4	12.1%
	Mostly agree	15	45.4%
	Undecided	8	24.2%

Variables	Categories	Frequency	Percentage out of total
	Mostly disagree	6	18.2%
	Completely disagree	0	0.0%
6. Students' knowledge can be used to improve processes and performance in the organisation.	Completely agree	5	15.2%
	Mostly agree	21	63.6%
	Undecided	4	12.1%
	Mostly disagree	3	9.1%
	Completely disagree	0	0.0%
CRITICAL SHORTCOMINGS AT UNIVERSITY			
7. There is a lack of sharing of knowledge and expertise between University and industry.	Completely agree	2	6.1%
	Mostly agree	14	42.4%
	Undecided	11	33.3%
	Mostly disagree	4	12.1%
	Completely disagree	1	3.0%
	Unknown	1	3.0%
8. The University has regular contact sessions with students in the industry.	Completely agree	2	6.1%
	Mostly agree	6	18.2%
	Undecided	15	45.4%
	Mostly disagree	8	24.2%
	Completely disagree	1	3.0%
	Unknown	1	3.0%
9. The department has a staff member that is known to industry that deals with industry related matters.	Completely agree	12	36.4%
	Mostly agree	13	39.4%
	Undecided	5	15.2%
	Mostly disagree	2	6.1%
	Completely disagree	1	3.0%
10. Industry linkages are encouraged at University level and industry is informed of possible collaborations.	Completely agree	1	3.0%
	Mostly agree	9	27.3%
	Undecided	14	42.4%
	Mostly disagree	9	27.3%
	Completely disagree	0	0.0%

KEY ELEMENTS WHICH ARE CRITICAL FOR SUCCESSFUL KNOWLEDGE TRANSFER			
11. There is a link between successful knowledge transfer and continuous improvement.	Completely agree	14	42.4%
	Mostly agree	16	48.5%
	Undecided	1	3.0%
	Mostly disagree	2	6.1%
	Completely disagree	0	0.0%
12. The application of quality tools and techniques contribute to knowledge transfer processes.	Completely agree	12	36.4%
	Mostly agree	20	60.6%
	Undecided	1	3.0%
	Mostly disagree	0	0.0%
	Completely disagree	0	0.0%
13. Creating an enabling environment is important for successful knowledge transfer.	Completely agree	14	42.4%
	Mostly agree	17	51.5%
	Undecided	1	3.0%
	Mostly disagree	1	3.0%
	Completely disagree	0	0.0%
14. A lack of knowledge transfer processes impacts negatively on the organisation’s performance.	Completely agree	17	51.5%
	Mostly agree	9	27.3%
	Undecided	5	15.2%
	Mostly disagree	2	6.1%
	Completely disagree	0	0.0%
KNOWLEDGE GAP BETWEEN TERTIARY INSTITUTIONS AND INDUSTRY			
15. Industry is informed of Advisory Board meetings and their input is encouraged.	Completely agree	1	3.0%
	Mostly agree	20	60.6%
	Undecided	3	9.1%
	Mostly disagree	3	9.1%
	Completely disagree	5	15.2%
	Unknown	1	3.0%
16. The outcome of the Advisory Board meeting is communicated to the relevant industries.	Completely agree	1	3.0%
	Mostly agree	14	42.4%
	Undecided	6	18.2%
	Mostly disagree	4	12.1%

	Completely disagree	7	21.2%
	Unknown	1	3.0%
17. Industry is involved in curriculum reviews.	Completely agree	1	3.0%
	Mostly agree	1	3.0%
	Undecided	17	51.5%
	Mostly disagree	6	18.2%
	Completely disagree	7	21.2%
	Unknown	1	3.0%
18. Mechanisms are in place to track a student's transition from University to industry.	Completely agree	1	3.0%
	Mostly agree	4	12.1%
	Undecided	17	51.5%
	Mostly disagree	7	21.2%
	Completely disagree	4	12.1%
19. Students know how to apply their knowledge in industry.	Completely agree	1	3.0%
	Mostly agree	7	21.2%
	Undecided	7	21.2%
	Mostly disagree	17	51.5%
	Completely disagree	1	3.0%
20. Employees create an opportunity for students to apply their knowledge.	Completely agree	6	18.2%
	Mostly agree	24	72.7%
	Undecided	1	3.0%
	Mostly disagree	1	3.0%
	Completely disagree	1	3.0%

Annexure H:

Table 5.11: Descriptive statistics for staff questionnaire – Mean, Median, Standard Deviation and Range

Variable	N	Mean	Standard Deviation	Median	Range
CRITICAL SHORTCOMINGS AT UNIVERSITY					
1. There is a lack of knowledge and expertise between University and industry.	6	2.5	1.2247	2.0	3.0
2. The University has regular contact sessions with students in the industry.	6	1.8	1.1690	1.5	3.0
3. The department has a staff member that is known to industry that deals with industry related matters.	6	1.0	0.0000	1.0	0.0
4. Industry linkages are encouraged at University level and industry is informed of possible collaborations.	6	2.3	1.0328	2.0	3.0
KEY ELEMENTS WHICH ARE CRITICAL FOR SUCCESSFUL KNOWLEDGE TRANSFER					
5. There is a link between successful knowledge transfer and continuous improvement.	6	2.3	1.3663	2.0	3.0
6. The application of quality tools and techniques contribute to knowledge transfer processes.	6	2.3	1.3663	2.0	4.0
7. Creating an enabling environment is important for successful knowledge transfer.	6	1.3	0.5164	1.0	1.0
8. A lack of knowledge transfer processes impacts negatively on the organisation's performance.	6	1.3	0.5164	1.0	1.0

KNOWLEDGE GAP BETWEEN UNIVERSITY AND INDUSTRY					
15. Industry is informed of Advisory Board meetings and their input is encouraged.	6	1.8	1.6021	1.0	4.0
16. The outcome of the Advisory Board meeting is communicated to the relevant industries.	6	2.8	1.3292	2.0	3.0
17. Industry is involved in curriculum reviews.	6	1.8	0.4082	2.0	1.0
18. Mechanisms are in place to track a student's transition from University to industry.	6	3.8	1.3292	4.0	3.0
19. Students know how to apply their knowledge in industry.	6	3.3	0.8165	3.5	2.0
20. Employees create an opportunity for students to apply their knowledge.	6	2.7	0.8165	2.5	2.0

Annexure I:

Table 5.12: Descriptive statistics for industry questionnaire – Mean, Median, Standard Deviation and Range

Variable	N	Mean	Standard Deviation	Median	Range
INDUSTRY DEMANDS WITH RESPECT TO KNOWLEDGE TRANSFER FROM GRADUATE STUDENTS					
1. Your organisation informs the University of what is expected in industry.	32	3.4	1.0429	3.5	4.0
2. Students are given the opportunity to apply their knowledge in industry.	33	2.1	0.6586	2.0	3.0
3. The organisation communicates shortcomings in students' knowledge and knowledge transfer abilities to the University.	32	3.2	0.9873	3.0	4.0
4. Regular discussions with the University with regard to student projects are held.	32	3.1	0.9954	3.0	3.0
5. Student projects are practical and can be applied in industry.	33	2.5	0.9395	2.0	3.0
6. Students' knowledge can be used to improve processes and performance in the organisation.	33	2.2	0.7953	2.0	3.0
CRITICAL SHORTCOMINGS AT UNIVERSITY					
7. There is a lack of sharing of knowledge and expertise between University and industry.	32	2.6	0.9070	2.5	4.0
8. The University has regular contact sessions with students in the industry.	32	3.0	0.9158	3.0	4.0
9. The department has a staff member that is known to industry that deals with industry related matters.	33	2.0	1.0308	2.0	4.0

Variable	N	Mean	Standard Deviation	Median	Range
10. Industry linkages are encouraged at University level and industry is informed of possible collaborations.	33	2.9	0.8269	3.0	3.0
KEY ELEMENTS WHICH ARE CRITICAL FOR SUCCESSFUL KNOWLEDGE TRANSFER					
11. There is a link between successful knowledge transfer and continuous improvement.	33	1.7	0.8013	2.0	3.0
12. The application of quality tools and techniques contribute to knowledge transfer processes.	33	1.7	0.5401	2.0	2.0
13. Creating an enabling environment is important for successful knowledge transfer.	33	1.7	0.6922	2.0	3.0
14. A lack of knowledge transfer processes impacts negatively on the organisation’s performance.	33	1.8	0.9364	1.0	3.0
KNOWLEDGE GAP BETWEEN UNIVERSITY AND INDUSTRY					
15. Industry is informed of Advisory Board meetings and their input is encouraged.	32	2.7	1.1977	2.0	4.0
16. The outcome of the Advisory Board meeting is communicated to the relevant industries.	32	3.1	1.2684	3.0	4.0
17. Industry is involved in curriculum reviews.	32	3.5	0.9832	3.0	4.0
18. Mechanisms are in place to track a student’s transition from University to industry.	33	3.3	0.9445	3.0	4.0
19. Students know how to apply their knowledge in industry.	33	3.3	0.9515	4.0	4.0

20. Employees create an opportunity for students to apply their knowledge.	33	2.0	0.7906	2.0	4.0

Annexure J:

Cronbach Alpha Coefficients for the items in the staff questionnaire

Simple Statistics

Variable	N	Mean	Std Dev	Sum	Minimum	Maximum	Label
Q1	6	2.50000	1.22474	15.00000	1.00000	4.00000	Q1
Q2	6	1.83333	1.16905	11.00000	1.00000	4.00000	Q2
Q4	6	2.33333	1.03280	14.00000	1.00000	4.00000	Q4
Q5	6	2.33333	1.36626	14.00000	1.00000	4.00000	Q5
Q6	6	2.33333	1.36626	14.00000	1.00000	5.00000	Q6
Q7	6	1.33333	0.51640	8.00000	1.00000	2.00000	Q7
Q8	6	1.33333	0.51640	8.00000	1.00000	2.00000	Q8
Q15	6	1.83333	1.60208	11.00000	1.00000	5.00000	Q15
Q16	6	2.83333	1.32916	17.00000	2.00000	5.00000	Q16
Q17	6	1.83333	0.40825	11.00000	1.00000	2.00000	Q17
Q18	6	3.83333	1.32916	23.00000	2.00000	5.00000	Q18
Q19	6	3.33333	0.81650	20.00000	2.00000	4.00000	Q19
Q20	6	2.66667	0.81650	16.00000	2.00000	4.00000	Q20

Cronbach Coefficient Alpha

Variables	Alpha
Raw	0.713377
Standardized	0.680131

Cronbach Coefficient Alpha with Deleted Variable

	Raw Variables		Standardized Variables		
Deleted Variable	Correlation with Total	Alpha	Correlation with Total	Alpha	Label
Q1	-.439201	0.794143	-.453788	0.760690	Q1
Q2	-.012737	0.741786	0.157620	0.683619	Q2
Q4	0.670365	0.654150	0.465815	0.638230	Q4
Q5	0.182448	0.721977	0.001647	0.704855	Q5
Q6	0.512348	0.668687	0.323327	0.659795	Q6
Q7	-.113228	0.728827	-.017835	0.707429	Q7
Q8	0.057354	0.719298	0.057004	0.697447	Q8
Q15	0.903468	0.580790	0.796342	0.584169	Q15
Q16	0.970420	0.585659	0.968277	0.553712	Q16
Q17	0.108941	0.716084	0.085140	0.693628	Q17
Q18	0.457022	0.678265	0.577977	0.620529	Q18
Q19	0.583874	0.674013	0.644160	0.609777	Q19
Q20	0.556055	0.676801	0.706464	0.599444	Q20

Cronbach Coefficient Alpha

Variables	Alpha
Raw	0.794143
Standardized	0.760690

Cronbach Coefficient Alpha with Deleted Variable

	Raw Variables		Standardized Variables		
Deleted Variable	Correlation with Total	Alpha	Correlation with Total	Alpha	Label
Q2	-.000000	0.822135	0.159001	0.770445	Q2
Q4	0.619436	0.762258	0.431936	0.740235	Q4
Q5	0.236646	0.804608	0.059797	0.780795	Q5
Q6	0.497522	0.773588	0.322097	0.752704	Q6
Q7	-.000000	0.804844	0.086163	0.778076	Q7
Q8	0.107937	0.800259	0.105541	0.776063	Q8
Q15	0.882998	0.715873	0.785001	0.697181	Q15
Q16	0.958322	0.712734	0.953408	0.674976	Q16
Q17	0.067937	0.801026	0.046798	0.782128	Q17
Q18	0.588929	0.762092	0.691647	0.709018	Q18
Q19	0.581018	0.770403	0.634080	0.716152	Q19
Q20	0.516724	0.775162	0.651184	0.714045	Q20

Cronbach Coefficient Alpha

Variables	Alpha
Raw	-.201923
Standardized	-.204900

Cronbach Coefficient Alpha with Deleted Variable

Raw Variables Standardized Variables

Deleted Variable	Correlation with Total	Alpha	Correlation with Total	Alpha	Label
Q1	-.055470	-.246154	-.052362	-.248281	Q1
Q2	-.124584	0.000000	-.127473	0.000000	Q2
Q4	-.079057	-.150000	-.080965	-.150175	Q4

Cronbach Coefficient Alpha

Variables	Alpha
Raw	0.210526
Standardized	-.327421

Cronbach Coefficient Alpha with Deleted Variable

	Raw Variables		Standardized Variables		
Deleted Variable	Correlation with Total	Alpha	Correlation with Total	Alpha	Label
Q5	0.668153	-1.50000	0.236898	-1.29472	Q5
Q6	0.310530	-.300000	-.160782	-.139899	Q6
Q7	-.474342	0.500000	-.366189	0.250421	Q7
Q8	-.169842	0.346154	-.081466	-.323841	Q8

Cronbach Coefficient Alpha

Variables	Alpha
Raw	0.852792
Standardized	0.863993

Cronbach Coefficient Alpha with Deleted Variable

	Raw Variables		Standardized Variables		
Deleted Variable	Correlation with Total	Alpha	Correlation with Total	Alpha	Label
Q15	0.732604	0.821995	0.679401	0.837209	Q15
Q16	0.909980	0.767108	0.848194	0.805663	Q16
Q17	0.345005	0.873819	0.351288	0.892650	Q17
Q18	0.673172	0.823587	0.672620	0.838433	Q18
Q19	0.705024	0.825163	0.708152	0.831986	Q19
Q20	0.664540	0.830645	0.719393	0.829927	Q20

Pearson Correlation Coefficients, N = 6
Prob > |r| under H0: Rho=0

	Q1	Q2	Q4	Q5	Q6	Q7	Q8
Q1	1.00000	-0.06984	0.00000	-0.35857	-0.11952	-0.63246	-0.31623
Q1		0.8954	1.0000	0.4852	0.8216	0.1778	0.5415
Q2	-0.06984	1.00000	-0.11043	-0.33391	-0.58435	0.44173	0.77302
Q2	0.8954		0.8350	0.5177	0.2232	0.3805	0.0714
Q4	0.00000	-0.11043	1.00000	0.75593	0.75593	-0.62500	0.12500
Q4	1.0000	0.8350		0.0821	0.0821	0.1846	0.8135
Q5	-0.35857	-0.33391	0.75593	1.00000	0.67857	-0.47246	0.09449
Q5	0.4852	0.5177	0.0821		0.1384	0.3440	0.8587
Q6	-0.11952	-0.58435	0.75593	0.67857	1.00000	-0.47246	-0.47246
Q6	0.8216	0.2232	0.0821	0.1384		0.3440	0.3440
Q7	-0.63246	0.44173	-0.62500	-0.47246	-0.47246	1.00000	0.25000
Q7	0.1778	0.3805	0.1846	0.3440	0.3440		0.6328
Q8	-0.31623	0.77302	0.12500	0.09449	-0.47246	0.25000	1.00000
Q8	0.5415	0.0714	0.8135	0.8587	0.3440	0.6328	
Q15	-0.25482	-0.12458	0.76553	0.48732	0.85280	-0.16116	-0.16116
Q15	0.6260	0.8141	0.0760	0.3269	0.0309	0.7603	0.7603
Q16	-0.30715	0.23597	0.63134	0.25698	0.58738	0.09713	0.09713
Q16	0.5538	0.6526	0.1788	0.6230	0.2203	0.8548	0.8548
Q17	0.20000	-0.06984	-0.31623	-0.59761	0.11952	0.31623	-0.63246
Q17	0.7040	0.8954	0.5415	0.2103	0.8216	0.5415	0.1778
Q18	-0.79858	0.10726	0.04856	0.03671	0.25698	0.67990	0.09713
Q18	0.0568	0.8397	0.9272	0.9450	0.6230	0.1373	0.8548
Q19	-0.20000	0.06984	0.31623	-0.11952	0.23905	0.15811	0.15811
Q19	0.7040	0.8954	0.5415	0.8216	0.6483	0.7648	0.7648
Q20	0.00000	0.55874	0.15811	-0.41833	-0.05976	0.31623	0.31623
Q20	1.0000	0.2491	0.7648	0.4091	0.9105	0.5415	0.5415

	Q15	Q16	Q17	Q18	Q19	Q20
Q1	-0.25482	-0.30715	0.20000	-0.79858	-0.20000	0.00000
Q1	0.6260	0.5538	0.7040	0.0568	0.7040	1.0000
Q2	-0.12458	0.23597	-0.06984	0.10726	0.06984	0.55874
Q2	0.8141	0.6526	0.8954	0.8397	0.8954	0.2491
Q4	0.76553	0.63134	-0.31623	0.04856	0.31623	0.15811
Q4	0.0760	0.1788	0.5415	0.9272	0.5415	0.7648

Q5	0.48732	0.25698	-0.59761	0.03671	-0.11952	-0.41833
Q5	0.3269	0.6230	0.2103	0.9450	0.8216	0.4091
Q6	0.85280	0.58738	0.11952	0.25698	0.23905	-0.05976
Q6	0.0309	0.2203	0.8216	0.6230	0.6483	0.9105
Q7	-0.16116	0.09713	0.31623	0.67990	0.15811	0.31623
Q7	0.7603	0.8548	0.5415	0.1373	0.7648	0.5415
Q8	-0.16116	0.09713	-0.63246	0.09713	0.15811	0.31623
Q8	0.7603	0.8548	0.1778	0.8548	0.7648	0.5415
Q15	1.00000	0.92357	0.25482	0.54788	0.50965	0.40772
Q15		0.0085	0.6260	0.2604	0.3017	0.4223
Q16	0.92357	1.00000	0.30715	0.66038	0.61430	0.67572
Q16	0.0085		0.5538	0.1534	0.1945	0.1407
Q17	0.25482	0.30715	1.00000	0.30715	0.20000	0.40000
Q17	0.6260	0.5538		0.5538	0.7040	0.4320
Q18	0.54788	0.66038	0.30715	1.00000	0.61430	0.49144
Q18	0.2604	0.1534	0.5538		0.1945	0.3222
Q19	0.50965	0.61430	0.20000	0.61430	1.00000	0.80000
Q19	0.3017	0.1945	0.7040	0.1945		0.0560
Q20	0.40772	0.67572	0.40000	0.49144	0.80000	1.00000
Q20	0.4223	0.1407	0.4320	0.3222	0.0560	

Annexure K:
Cronbach Alpha Coefficients for the items in the industry questionnaire

Simple Statistics

Variable	N	Mean	Std Dev	Sum	Minimum	Maximum	Label
Q1	32	3.40625	1.04293	109.00000	1.00000	5.00000	Q1
Q2	32	2.06250	0.66901	66.00000	1.00000	4.00000	Q2
Q3	32	3.15625	0.98732	101.00000	1.00000	5.00000	Q3
Q4	32	3.09375	0.99545	99.00000	1.00000	4.00000	Q4
Q5	32	2.50000	0.95038	80.00000	1.00000	4.00000	Q5
Q6	32	2.15625	0.80760	69.00000	1.00000	4.00000	Q6
Q7	32	2.62500	0.90696	84.00000	1.00000	5.00000	Q7
Q8	32	3.00000	0.91581	96.00000	1.00000	5.00000	Q8
Q9	32	2.00000	1.04727	64.00000	1.00000	5.00000	Q9
Q10	32	2.93750	0.84003	94.00000	1.00000	4.00000	Q10
Q11	32	1.71875	0.81258	55.00000	1.00000	4.00000	Q11
Q12	32	1.65625	0.54532	53.00000	1.00000	3.00000	Q12
Q13	32	1.65625	0.70066	53.00000	1.00000	4.00000	Q13
Q14	32	1.71875	0.92403	55.00000	1.00000	4.00000	Q14
Q15	32	2.71875	1.19770	87.00000	1.00000	5.00000	Q15
Q16	32	3.06250	1.26841	98.00000	1.00000	5.00000	Q16
Q17	32	3.53125	0.98323	113.00000	1.00000	5.00000	Q17
Q18	32	3.31250	0.93109	106.00000	1.00000	5.00000	Q18
Q19	32	3.31250	0.96512	106.00000	1.00000	5.00000	Q19
Q20	32	2.00000	0.80322	64.00000	1.00000	5.00000	Q20

Cronbach Coefficient Alpha

Variables	Alpha
Raw	0.756467
Standardized	0.765708

Cronbach Coefficient Alpha with Deleted Variable

	Raw Variables		Standardized Variables		
Deleted Variable	Correlation with Total	Alpha	Correlation with Total	Alpha	Label
Q1	0.377733	0.742011	0.425155	0.749328	Q1
Q2	0.323013	0.747553	0.351016	0.754613	Q2
Q3	0.626431	0.721745	0.622930	0.734782	Q3
Q4	0.391934	0.740974	0.430820	0.748920	Q4
Q5	0.481306	0.734260	0.531841	0.741563	Q5
Q6	0.202296	0.754347	0.240164	0.762350	Q6
Q7	0.050563	0.765470	0.081230	0.773101	Q7
Q8	0.388495	0.741653	0.369171	0.753327	Q8
Q9	0.353605	0.744036	0.336071	0.755668	Q9
Q10	0.484940	0.735635	0.444133	0.747960	Q10
Q11	0.404619	0.741403	0.440995	0.748187	Q11
Q12	0.410027	0.744994	0.419969	0.749700	Q12
Q13	0.141330	0.757206	0.170935	0.767082	Q13
Q14	0.312684	0.747200	0.351033	0.754612	Q14
Q15	0.197791	0.759123	0.140339	0.769149	Q15
Q16	0.207128	0.759535	0.152376	0.768338	Q16
Q17	0.378080	0.742126	0.289675	0.758919	Q17
Q18	0.381605	0.742078	0.362205	0.753822	Q18
Q19	0.275186	0.750087	0.298603	0.758296	Q19
Q20	0.109425	0.760033	0.107786	0.771333	Q20

Cronbach Coefficient Alpha

Variables	Alpha
Raw	0.755844
Standardized	0.755895

Cronbach Coefficient Alpha with Deleted Variable

	Raw Variables		Standardized Variables		
Deleted Variable	Correlation with Total	Alpha	Correlation with Total	Alpha	Label
Q1	0.475348	0.728626	0.481282	0.724475	Q1
Q2	0.515894	0.722980	0.509146	0.716973	Q2
Q3	0.529951	0.711053	0.525962	0.712397	Q3
Q4	0.592117	0.692278	0.578805	0.697779	Q4
Q5	0.655629	0.674195	0.656041	0.675749	Q5
Q6	0.244548	0.777859	0.247000	0.783714	Q6

Cronbach Coefficient Alpha

Variables	Alpha

Raw	0.158632
Standardized	0.176912

Cronbach Coefficient Alpha with Deleted Variable

Deleted Variable	Raw Variables Correlation with Total	Raw Variables Alpha	Standardized Variables Correlation with Total	Standardized Variables Alpha	Label
Q7	-.244647	0.508577	-.231272	0.522685	Q7
Q8	0.250990	-.152284	0.258540	-.134077	Q8
Q9	0.056860	0.155725	0.064892	0.166095	Q9
Q10	0.360320	-.293706	0.354719	-.305776	Q10

Cronbach Coefficient Alpha

Variables	Alpha
Raw	0.718535
Standardized	0.738937

Cronbach Coefficient Alpha with Deleted Variable

Deleted Variable	Raw Variables Correlation with Total	Raw Variables Alpha	Standardized Variables Correlation with Total	Standardized Variables Alpha	Label
Q11	0.387849	0.730088	0.446551	0.726592	Q11
Q12	0.613109	0.630016	0.611172	0.632684	Q12
Q13	0.521959	0.649970	0.473047	0.712132	Q13
Q14	0.595641	0.606230	0.600494	0.639074	Q14

Cronbach Coefficient Alpha

Variables	Alpha
Raw	0.709926
Standardized	0.686499

Cronbach Coefficient Alpha with Deleted Variable

Deleted Variable	Raw Variables Correlation with Total	Raw Variables Alpha	Standardized Variables Correlation with Total	Standardized Variables Alpha	Label
Q15	0.610918	0.609103	0.547845	0.600483	Q15
Q16	0.679693	0.578321	0.619505	0.574511	Q16
Q17	0.818552	0.549954	0.763462	0.519453	Q17
Q18	0.424427	0.676531	0.455194	0.632692	Q18
Q19	0.086353	0.765324	0.115983	0.738158	Q19
Q20	0.083967	0.754097	0.099941	0.742687	Q20

Pearson Correlation Coefficients, N = 32
Prob > |r| under H0: Rho=0

	Q1	Q2	Q3	Q4	Q5	Q6	Q7
Q1	1.00000	0.42476	0.40628	0.33499	0.34172	0.15200	0.30267
Q1		0.0154	0.0210	0.0609	0.0556	0.4063	0.0922
Q2	0.42476	1.00000	0.47310	0.32998	0.35514	0.16046	0.19936
Q2	0.0154		0.0062	0.0651	0.0461	0.3803	0.2740
Q3	0.40628	0.47310	1.00000	0.50976	0.39535	0.00885	-0.00450
Q3	0.0210	0.0062		0.0029	0.0251	0.9617	0.9805
Q4	0.33499	0.32998	0.50976	1.00000	0.63080	0.14169	-0.06699
Q4	0.0609	0.0651	0.0029		0.0001	0.4392	0.7156
Q5	0.34172	0.35514	0.39535	0.63080	1.00000	0.44130	0.18712
Q5	0.0556	0.0461	0.0251	0.0001		0.0115	0.3051
Q6	0.15200	0.16046	0.00885	0.14169	0.44130	1.00000	-0.09359
Q6	0.4063	0.3803	0.9617	0.4392	0.0115		0.6104
Q7	0.30267	0.19936	-0.00450	-0.06699	0.18712	-0.09359	1.00000
Q7	0.0922	0.2740	0.9805	0.7156	0.3051	0.6104	
Q8	0.27019	0.05265	0.53514	0.10615	0.29650	0.08723	-0.11651
Q8	0.1348	0.7747	0.0016	0.5631	0.0994	0.6350	0.5254
Q9	0.20674	0.18416	0.53036	0.40226	0.09723	-0.07628	-0.30566
Q9	0.2563	0.3130	0.0018	0.0225	0.5965	0.6782	0.0889
Q10	0.02992	0.06457	0.51778	0.31585	0.08081	-0.12779	-0.07410
Q10	0.8709	0.7255	0.0024	0.0782	0.6602	0.4858	0.6869
Q11	0.17724	0.03338	0.25758	0.39257	0.48037	0.41322	0.15867
Q11	0.3318	0.8561	0.1547	0.0263	0.0054	0.0187	0.3857
Q12	0.31018	-0.02763	0.16289	0.35840	0.40457	0.41888	0.25274
Q12	0.0840	0.8807	0.3731	0.0440	0.0216	0.0170	0.1628
Q13	0.28556	0.25376	-0.01311	0.09394	0.12111	0.15499	0.19670
Q13	0.1131	0.1611	0.9432	0.6091	0.5091	0.3970	0.2806
Q14	0.32323	0.23808	0.22652	0.31015	0.27550	0.06079	0.13953
Q14	0.0712	0.1895	0.2125	0.0841	0.1270	0.7410	0.4463
Q15	-0.26713	-0.25916	0.06564	-0.13951	-0.18421	-0.01980	-0.18931

Q15	0.1394	0.1521	0.7211	0.4463	0.3129	0.9143	0.2994
Q16	-0.19051	-0.30886	0.06923	-0.23472	-0.26760	-0.13580	-0.03505
Q16	0.2963	0.0854	0.7066	0.1960	0.1387	0.4586	0.8490
Q17	-0.09142	-0.15018	0.21080	-0.18436	-0.05178	-0.18916	0.12209
Q17	0.6187	0.4120	0.2468	0.3124	0.7784	0.2998	0.5056
Q18	0.33012	0.12299	0.26098	-0.06743	0.18227	0.19036	0.21965
Q18	0.0650	0.5025	0.1491	0.7138	0.3181	0.2967	0.2271
Q19	0.09414	0.11866	0.15022	0.16998	0.42203	0.34920	-0.11977
Q19	0.6083	0.5178	0.4118	0.3523	0.0161	0.0501	0.5138
Q20	0.00000	0.60030	0.16271	0.08069	0.04226	0.04973	-0.08856
Q20	1.0000	0.0003	0.3736	0.6607	0.8184	0.7869	0.6298

	Q8	Q9	Q10	Q11	Q12	Q13	Q14
Q1	0.27019	0.20674	0.02992	0.17724	0.31018	0.28556	0.32323
Q1	0.1348	0.2563	0.8709	0.3318	0.0840	0.1131	0.0712
Q2	0.05265	0.18416	0.06457	0.03338	-0.02763	0.25376	0.23808
Q2	0.7747	0.3130	0.7255	0.8561	0.8807	0.1611	0.1895
Q3	0.53514	0.53036	0.51778	0.25758	0.16289	-0.01311	0.22652
Q3	0.0016	0.0018	0.0024	0.1547	0.3731	0.9432	0.2125
Q4	0.10615	0.40226	0.31585	0.39257	0.35840	0.09394	0.31015
Q4	0.5631	0.0225	0.0782	0.0263	0.0440	0.6091	0.0841
Q5	0.29650	0.09723	0.08081	0.48037	0.40457	0.12111	0.27550
Q5	0.0994	0.5965	0.6602	0.0054	0.0216	0.5091	0.1270
Q6	0.08723	-0.07628	-0.12779	0.41322	0.41888	0.15499	0.06079
Q6	0.6350	0.6782	0.4858	0.0187	0.0170	0.3970	0.7410
Q7	-0.11651	-0.30566	-0.07410	0.15867	0.25274	0.19670	0.13953
Q7	0.5254	0.0889	0.6869	0.3857	0.1628	0.2806	0.4463
Q8	1.00000	0.16817	0.37738	0.21674	0.06459	-0.25136	-0.15248
Q8		0.3576	0.0332	0.2335	0.7254	0.1652	0.4048
Q9	0.16817	1.00000	0.25668	0.26535	0.11297	0.17585	0.33334
Q9	0.3576		0.1562	0.1422	0.5382	0.3357	0.0623
Q10	0.37738	0.25668	1.00000	0.20971	0.09242	-0.03768	0.10130
Q10	0.0332	0.1562		0.2493	0.6149	0.8378	0.5812
Q11	0.21674	0.26535	0.20971	1.00000	0.72115	0.10801	0.23495
Q11	0.2335	0.1422	0.2493		<.0001	0.5563	0.1955
Q12	0.06459	0.11297	0.09242	0.72115	1.00000	0.27175	0.37810
Q12	0.7254	0.5382	0.6149	<.0001		0.1324	0.0329
Q13	-0.25136	0.17585	-0.03768	0.10801	0.27175	1.00000	0.74270
Q13	0.1652	0.3357	0.8378	0.5563	0.1324		<.0001
Q14	-0.15248	0.33334	0.10130	0.23495	0.37810	0.74270	1.00000
Q14	0.4048	0.0623	0.5812	0.1955	0.0329	<.0001	
Q15	0.00000	0.30861	0.33465	-0.01761	0.04476	-0.15736	-0.04463
Q15	1.0000	0.0857	0.0612	0.9238	0.8078	0.3897	0.8083
Q16	0.05554	0.21856	0.36708	-0.07629	0.03206	-0.12023	0.01548
Q16	0.7627	0.2295	0.0388	0.6782	0.8617	0.5122	0.9330
Q17	0.25077	0.15664	0.43206	-0.04921	-0.06956	-0.19462	-0.04327
Q17	0.1662	0.3919	0.0135	0.7891	0.7052	0.2858	0.8141
Q18	0.49179	-0.16541	0.19075	0.07728	0.09133	-0.22560	-0.19450
Q18	0.0043	0.3656	0.2957	0.6742	0.6191	0.2144	0.2861
Q19	0.51095	-0.15958	0.26360	0.15682	0.14940	0.02087	-0.07913
Q19	0.0028	0.3830	0.1449	0.3914	0.4144	0.9097	0.6669
Q20	0.04385	0.03835	0.19124	-0.19770	-0.36823	0.00000	0.00000
Q20	0.8116	0.8349	0.2944	0.2781	0.0381	1.0000	1.0000

	Q15	Q16	Q17	Q18	Q19	Q20
Q1	-0.26713	-0.19051	-0.09142	0.33012	0.09414	0.00000
Q1	0.1394	0.2963	0.6187	0.0650	0.6083	1.0000
Q2	-0.25916	-0.30886	-0.15018	0.12299	0.11866	0.60030
Q2	0.1521	0.0854	0.4120	0.5025	0.5178	0.0003
Q3	0.06564	0.06923	0.21080	0.26098	0.15022	0.16271
Q3	0.7211	0.7066	0.2468	0.1491	0.4118	0.3736
Q4	-0.13951	-0.23472	-0.18436	-0.06743	0.16998	0.08069
Q4	0.4463	0.1960	0.3124	0.7138	0.3523	0.6607
Q5	-0.18421	-0.26760	-0.05178	0.18227	0.42203	0.04226
Q5	0.3129	0.1387	0.7784	0.3181	0.0161	0.8184
Q6	-0.01980	-0.13580	-0.18916	0.19036	0.34920	0.04973
Q6	0.9143	0.4586	0.2998	0.2967	0.0501	0.7869
Q7	-0.18931	-0.03505	0.12209	0.21965	-0.11977	-0.08856
Q7	0.2994	0.8490	0.5056	0.2271	0.5138	0.6298
Q8	0.00000	0.05554	0.25077	0.49179	0.51095	0.04385
Q8	1.0000	0.7627	0.1662	0.0043	0.0028	0.8116
Q9	0.30861	0.21856	0.15664	-0.16541	-0.15958	0.03835
Q9	0.0857	0.2295	0.3919	0.3656	0.3830	0.8349
Q10	0.33465	0.36708	0.43206	0.19075	0.26360	0.19124
Q10	0.0612	0.0388	0.0135	0.2957	0.1449	0.2944
Q11	-0.01761	-0.07629	-0.04921	0.07728	0.15682	-0.19770
Q11	0.9238	0.6782	0.7891	0.6742	0.3914	0.2781
Q12	0.04476	0.03206	-0.06956	0.09133	0.14940	-0.36823
Q12	0.8078	0.8617	0.7052	0.6191	0.4144	0.0381

Q13	-0.15736	-0.12023	-0.19462	-0.22560	0.02087	0.00000
Q13	0.3897	0.5122	0.2858	0.2144	0.9097	1.0000
Q14	-0.04463	0.01548	-0.04327	-0.19450	-0.07913	0.00000
Q14	0.8083	0.9330	0.8141	0.2861	0.6669	1.0000
Q15	1.00000	0.88254	0.76101	0.13921	-0.11686	0.03353
Q15		<.0001	<.0001	0.4473	0.5242	0.8554
Q16	0.88254	1.00000	0.85195	0.25607	-0.04282	-0.06332
Q16	<.0001		<.0001	0.1572	0.8160	0.7306
Q17	0.76101	0.85195	1.00000	0.44706	0.09136	0.08169
Q17	<.0001	<.0001		0.0103	0.6190	0.6567
Q18	0.13921	0.25607	0.44706	1.00000	0.39039	0.21567
Q18	0.4473	0.1572	0.0103		0.0272	0.2358
Q19	-0.11686	-0.04282	0.09136	0.39039	1.00000	0.08323
Q19	0.5242	0.8160	0.6190	0.0272		0.6507
Q20	0.03353	-0.06332	0.08169	0.21567	0.08323	1.00000
Q20	0.8554	0.7306	0.6567	0.2358	0.6507	

Annexure L:
Descriptive statistics: Frequency tables for staff questionnaire

Q1	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Completely agree	1	16.67	1	16.67
Mostly agree	3	50.00	4	66.67
Mostly disagree	2	33.33	6	100.00

Chi-Square Test
for Equal Proportions

Chi-Square	1.0000
DF	2
Pr > ChiSq	0.6065

WARNING: The table cells have expected counts less than 5. Chi-Square may not be a valid test.

Sample Size = 6

Q2	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Completely agree	3	50.00	3	50.00
Mostly agree	2	33.33	5	83.33
Mostly disagree	1	16.67	6	100.00

Chi-Square Test
for Equal Proportions

Chi-Square	1.0000
DF	2
Pr > ChiSq	0.6065

WARNING: The table cells have expected counts less than 5. Chi-Square may not be a valid test.

Sample Size = 6

Q3	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Completely agree	6	100.00	6	100.00

Chi-Square Test
for Equal Proportions

Chi-Square	0.0000
DF	0
Pr > ChiSq	.

Sample Size = 6

Q4	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Completely agree	1	16.67	1	16.67
Mostly agree	3	50.00	4	66.67
Undecided	1	16.67	5	83.33
Mostly disagree	1	16.67	6	100.00

Chi-Square Test
for Equal Proportions

Chi-Square	2.0000
DF	3
Pr > ChiSq	0.5724

WARNING: The table cells have expected counts less than 5. Chi-Square may not be a valid test.

Sample Size = 6

Q5	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Completely agree	2	33.33	2	33.33
Mostly agree	2	33.33	4	66.67
Mostly disagree	2	33.33	6	100.00

Chi-Square Test
for Equal Proportions

Chi-Square	0.0000
DF	2
Pr > ChiSq	1.0000

WARNING: The table cells have expected counts less than 5. Chi-Square may not be a valid test.

Sample Size = 6

Q6	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Completely agree	1	16.67	1	16.67
Mostly agree	4	66.67	5	83.33
Completely disagree	1	16.67	6	100.00

Chi-Square Test
for Equal Proportions

Chi-Square	3.0000
DF	2
Pr > ChiSq	0.2231

WARNING: The table cells have expected counts less than 5. Chi-Square may not be a valid test.

Sample Size = 6

Q7	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Completely agree	4	66.67	4	66.67
Mostly agree	2	33.33	6	100.00

Chi-Square Test
for Equal Proportions

Chi-Square	0.6667
DF	1
Pr > ChiSq	0.4142

WARNING: The table cells have expected counts less than 5. Chi-Square may not be a valid test.

Sample Size = 6

Q8	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Completely agree	4	66.67	4	66.67
Mostly agree	2	33.33	6	100.00

Chi-Square Test
for Equal Proportions

Chi-Square	0.6667
DF	1
Pr > ChiSq	0.4142

WARNING: The table cells have expected counts less than 5. Chi-Square may not be a valid test.

Sample Size = 6

Cumulative Cumulative

Q15	Frequency	Percent	Frequency	Percent
Completely agree	4	66.67	4	66.67
Mostly agree	1	16.67	5	83.33
Completely disagree	1	16.67	6	100.00

Chi-Square Test for Equal Proportions	
Chi-Square	3.0000
DF	2
Pr > ChiSq	0.2231

WARNING: The table cells have expected counts less than 5. Chi-Square may not be a valid test.

Sample Size = 6

Q16	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Mostly agree	4	66.67	4	66.67
Mostly disagree	1	16.67	5	83.33
Completely disagree	1	16.67	6	100.00

Chi-Square Test for Equal Proportions	
Chi-Square	3.0000
DF	2
Pr > ChiSq	0.2231

WARNING: The table cells have expected counts less than 5. Chi-Square may not be a valid test.

Sample Size = 6

Q17	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Completely agree	1	16.67	1	16.67
Mostly agree	5	83.33	6	100.00

Chi-Square Test for Equal Proportions	
Chi-Square	2.6667
DF	1
Pr > ChiSq	0.1025

WARNING: The table cells have expected counts less than 5. Chi-Square may not be a valid test.

Sample Size = 6

Q18	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Mostly agree	1	16.67	1	16.67
Undecided	2	33.33	3	50.00
Completely disagree	3	50.00	6	100.00

Chi-Square Test for Equal Proportions	
Chi-Square	1.0000
DF	2
Pr > ChiSq	0.6065

WARNING: The table cells have expected counts less than 5. Chi-Square may not be a valid test.

Sample Size = 6

Q19	Frequency	Percent	Cumulative Frequency	Cumulative Percent

Mostly agree	1	16.67	1	16.67
Undecided	2	33.33	3	50.00
Mostly disagree	3	50.00	6	100.00

Chi-Square Test
for Equal Proportions

Chi-Square	1.0000
DF	2
Pr > ChiSq	0.6065

WARNING: The table cells have expected counts less than 5. Chi-Square may not be a valid test.

Sample Size = 6

Q20	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Mostly agree	3	50.00	3	50.00
Undecided	2	33.33	5	83.33
Mostly disagree	1	16.67	6	100.00

Chi-Square Test
for Equal Proportions

Chi-Square	1.0000
DF	2
Pr > ChiSq	0.6065

WARNING: The table cells have expected counts less than 5. Chi-Square may not be a valid test.

Sample Size = 6

Annexure M:
Descriptive statistics: Frequency tables for staff questionnaire

Q1	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	1	3.03	1	3.03
Completely agree	2	6.06	3	9.09
Mostly agree	3	9.09	6	18.18
Undecided	11	33.33	17	51.52
Mostly disagree	12	36.36	29	87.88
Completely disagree	4	12.12	33	100.00

Chi-Square Test for Equal Proportions

Chi-Square	20.6364
DF	5
Pr > ChiSq	0.0009

Sample Size = 33

Q2	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Completely agree	5	15.15	5	15.15
Mostly agree	22	66.67	27	81.82
Undecided	5	15.15	32	96.97
Mostly disagree	1	3.03	33	100.00

Chi-Square Test for Equal Proportions

Chi-Square	31.8485
DF	3
Pr > ChiSq	<.0001

Sample Size = 33

Q3	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	1	3.03	1	3.03
Completely agree	2	6.06	3	9.09
Mostly agree	6	18.18	9	27.27
Undecided	10	30.30	19	57.58
Mostly disagree	13	39.39	32	96.97
Completely disagree	1	3.03	33	100.00

Chi-Square Test for Equal Proportions

Chi-Square	23.5455
DF	5
Pr > ChiSq	0.0003

Sample Size = 33

Q4	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	1	3.03	1	3.03
Completely agree	3	9.09	4	12.12
Mostly agree	5	15.15	9	27.27
Undecided	10	30.30	19	57.58
Mostly disagree	14	42.42	33	100.00

Chi-Square Test for Equal Proportions

Chi-Square	17.1515
DF	4
Pr > ChiSq	0.0018

Sample Size = 33

Q5	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Completely agree	4	12.12	4	12.12
Mostly agree	15	45.45	19	57.58

Undecided	8	24.24	27	81.82
Mostly disagree	6	18.18	33	100.00

Chi-Square Test
for Equal Proportions

Chi-Square	8.3333
DF	3
Pr > ChiSq	0.0396

Sample Size = 33

Q6	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Completely agree	5	15.15	5	15.15
Mostly agree	21	63.64	26	78.79
Undecided	4	12.12	30	90.91
Mostly disagree	3	9.09	33	100.00

Chi-Square Test
for Equal Proportions

Chi-Square	26.5152
DF	3
Pr > ChiSq	<.0001

Sample Size = 33

Q7	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	1	3.03	1	3.03
Completely agree	2	6.06	3	9.09
Mostly agree	14	42.42	17	51.52
Undecided	11	33.33	28	84.85
Mostly disagree	4	12.12	32	96.97
Completely disagree	1	3.03	33	100.00

Chi-Square Test
for Equal Proportions

Chi-Square	28.6364
DF	5
Pr > ChiSq	<.0001

Sample Size = 33

Q8	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	1	3.03	1	3.03
Completely agree	2	6.06	3	9.09
Mostly agree	6	18.18	9	27.27
Undecided	15	45.45	24	72.73
Mostly disagree	8	24.24	32	96.97
Completely disagree	1	3.03	33	100.00

Chi-Square Test
for Equal Proportions

Chi-Square	27.1818
DF	5
Pr > ChiSq	<.0001

Sample Size = 33

Q9	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Completely agree	12	36.36	12	36.36
Mostly agree	13	39.39	25	75.76
Undecided	5	15.15	30	90.91
Mostly disagree	2	6.06	32	96.97
Completely disagree	1	3.03	33	100.00

Chi-Square Test
for Equal Proportions

Chi-Square	18.9697
DF	4
Pr > ChiSq	0.0008

Sample Size = 33

Q10	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Completely agree	1	3.03	1	3.03
Mostly agree	9	27.27	10	30.30
Undecided	14	42.42	24	72.73
Mostly disagree	9	27.27	33	100.00

Chi-Square Test
for Equal Proportions

Chi-Square	10.5152
DF	3
Pr > ChiSq	0.0147

Sample Size = 33

Q11	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Completely agree	14	42.42	14	42.42
Mostly agree	16	48.48	30	90.91
Undecided	1	3.03	31	93.94
Mostly disagree	2	6.06	33	100.00

Chi-Square Test
for Equal Proportions

Chi-Square	22.3939
DF	3
Pr > ChiSq	<.0001

Sample Size = 33

Q12	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Completely agree	12	36.36	12	36.36
Mostly agree	20	60.61	32	96.97
Undecided	1	3.03	33	100.00

Chi-Square Test
for Equal Proportions

Chi-Square	16.5455
DF	2
Pr > ChiSq	0.0003

Sample Size = 33

Q13	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Completely agree	14	42.42	14	42.42
Mostly agree	17	51.52	31	93.94
Undecided	1	3.03	32	96.97
Mostly disagree	1	3.03	33	100.00

Chi-Square Test
for Equal Proportions

Chi-Square	26.0303
DF	3
Pr > ChiSq	<.0001

Sample Size = 33

Q14	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Completely agree	17	51.52	17	51.52
Mostly agree	9	27.27	26	78.79
Undecided	5	15.15	31	93.94
Mostly disagree	2	6.06	33	100.00

Chi-Square Test
for Equal Proportions

Chi-Square	15.3636
DF	3
Pr > ChiSq	0.0015

Sample Size = 33

Q15	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	1	3.03	1	3.03
Completely agree	1	3.03	2	6.06
Mostly agree	20	60.61	22	66.67
Undecided	3	9.09	25	75.76
Mostly disagree	3	9.09	28	84.85
Completely disagree	5	15.15	33	100.00

Chi-Square Test
for Equal Proportions

Chi-Square	47.9091
DF	5
Pr > ChiSq	<.0001

Sample Size = 33

Q16	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	1	3.03	1	3.03
Completely agree	1	3.03	2	6.06
Mostly agree	14	42.42	16	48.48
Undecided	6	18.18	22	66.67
Mostly disagree	4	12.12	26	78.79
Completely disagree	7	21.21	33	100.00

Chi-Square Test
for Equal Proportions

Chi-Square	21.3636
DF	5
Pr > ChiSq	0.0007

Sample Size = 33

Q17	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	1	3.03	1	3.03
Completely agree	1	3.03	2	6.06
Mostly agree	1	3.03	3	9.09
Undecided	17	51.52	20	60.61
Mostly disagree	6	18.18	26	78.79
Completely disagree	7	21.21	33	100.00

Chi-Square Test
for Equal Proportions

Chi-Square	35.5455
DF	5
Pr > ChiSq	<.0001

Sample Size = 33

Q18	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Completely agree	1	3.03	1	3.03
Mostly agree	4	12.12	5	15.15
Undecided	17	51.52	22	66.67
Mostly disagree	7	21.21	29	87.88
Completely disagree	4	12.12	33	100.00

Chi-Square Test
for Equal Proportions

Chi-Square	23.2121
DF	4
Pr > ChiSq	0.0001

Sample Size = 33

Q19	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Completely agree	1	3.03	1	3.03
Mostly agree	7	21.21	8	24.24
Undecided	7	21.21	15	45.45
Mostly disagree	17	51.52	32	96.97

Completely disagree	1	3.03	33	100.00

Chi-Square Test
for Equal Proportions

Chi-Square	25.9394
DF	4
Pr > ChiSq	<.0001

Sample Size = 33

Q20	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Completely agree	6	18.18	6	18.18
Mostly agree	24	72.73	30	90.91
Undecided	1	3.03	31	93.94
Mostly disagree	1	3.03	32	96.97
Completely disagree	1	3.03	33	100.00

Chi-Square Test
for Equal Proportions

Chi-Square	60.1818
DF	4
Pr > ChiSq	<.0001

Sample Size = 33

Annexure N:

Descriptive statistics for staff questionnaire: Uni-variate with means & standard deviations where appropriate

```
                      Variable:  Q1  (Q1)
N                            6    Sum Weights                  6
Mean                       2.5    Sum Observations            15
Std Deviation       1.22474487    Variance                   1.5
Skewness            0.48989795    Kurtosis            -1.4666667
Uncorrected SS              45    Corrected SS               7.5
Coeff Variation     48.9897949    Std Error Mean             0.5

                   Basic Statistical Measures
         Location                    Variability
     Mean     2.500000     Std Deviation            1.22474
     Median   2.000000     Variance                 1.50000
     Mode     2.000000     Range                    3.00000
                           Interquartile Range      2.00000

                    Quantiles (Definition 5)
                     Quantile      Estimate
                     100% Max             4
                     99%                  4
                     95%                  4
                     90%                  4
                     75% Q3               4
                     50% Median           2
                     25% Q1               2
                     10%                  1
                     5%                   1
                     1%                   1
                     0% Min               1

                      Variable:  Q2  (Q2)
N                            6    Sum Weights                  6
Mean                1.83333333    Sum Observations            11
Std Deviation       1.16904519    Variance            1.36666667
Skewness            1.58561752    Kurtosis            2.55205235
Uncorrected SS              27    Corrected SS        6.83333333
Coeff Variation     63.7661015    Std Error Mean       0.4772607

                   Basic Statistical Measures
         Location                    Variability
     Mean     1.833333     Std Deviation            1.16905
     Median   1.500000     Variance                 1.36667
     Mode     1.000000     Range                    3.00000
                           Interquartile Range      1.00000

                    Quantiles (Definition 5)
                     Quantile      Estimate
                     100% Max           4.0
                     99%                4.0
                     95%                4.0
                     90%                4.0
                     75% Q3             2.0
                     50% Median         1.5
                     25% Q1             1.0
                     10%                1.0
                     5%                 1.0
                     1%                 1.0
                     0% Min             1.0
                      Variable:  Q3  (Q3)
N                            6    Sum Weights                  6
Mean                         1    Sum Observations             6
Std Deviation                0    Variance                     0
Skewness                     .    Kurtosis                     .
Uncorrected SS               6    Corrected SS                 0
Coeff Variation              0    Std Error Mean               0
```

Basic Statistical Measures

Location		Variability	
Mean	1.000000	Std Deviation	0
Median	1.000000	Variance	0
Mode	1.000000	Range	0
		Interquartile Range	0

Quantiles (Definition 5)

Quantile	Estimate
100% Max	1
99%	1
95%	1
90%	1
75% Q3	1
50% Median	1
25% Q1	1
10%	1
5%	1
1%	1
0% Min	1

Variable: Q4 (Q4)

N	6	Sum Weights	6
Mean	2.33333333	Sum Observations	14
Std Deviation	1.03279556	Variance	1.06666667
Skewness	0.66566901	Kurtosis	0.5859375
Uncorrected SS	38	Corrected SS	5.33333333
Coeff Variation	44.2626668	Std Error Mean	0.42163702

Basic Statistical Measures

Location		Variability	
Mean	2.333333	Std Deviation	1.03280
Median	2.000000	Variance	1.06667
Mode	2.000000	Range	3.00000
		Interquartile Range	1.00000

Quantiles (Definition 5)

Quantile	Estimate
100% Max	4
99%	4
95%	4
90%	4
75% Q3	3
50% Median	2
25% Q1	2
10%	1
5%	1
1%	1
0% Min	1

Variable: Q5 (Q5)

N	6	Sum Weights	6
Mean	2.33333333	Sum Observations	14
Std Deviation	1.3662601	Variance	1.86666667
Skewness	0.52280361	Kurtosis	-1.875
Uncorrected SS	42	Corrected SS	9.33333333
Coeff Variation	58.5540044	Std Error Mean	0.55777335

Basic Statistical Measures

Location		Variability	
Mean	2.333333	Std Deviation	1.36626
Median	2.000000	Variance	1.86667
Mode	1.000000	Range	3.00000
		Interquartile Range	3.00000

Quantiles (Definition 5)

Quantile	Estimate
100% Max	4
99%	4

Quantile	Estimate
95%	4
90%	4
75% Q3	4
50% Median	2
25% Q1	1
10%	1
5%	1
1%	1
0% Min	1

Variable: Q6 (Q6)

N	6	Sum Weights	6
Mean	2.33333333	Sum Observations	14
Std Deviation	1.3662601	Variance	1.86666667
Skewness	1.93437336	Kurtosis	4.55357143
Uncorrected SS	42	Corrected SS	9.33333333
Coeff Variation	58.5540044	Std Error Mean	0.55777335

Basic Statistical Measures

Location		Variability	
Mean	2.333333	Std Deviation	1.36626
Median	2.000000	Variance	1.86667
Mode	2.000000	Range	4.00000
		Interquartile Range	0

Quantiles (Definition 5)

Quantile	Estimate
100% Max	5
99%	5
95%	5
90%	5
75% Q3	2
50% Median	2
25% Q1	2
10%	1
5%	1
1%	1
0% Min	1

Variable: Q7 (Q7)

N	6	Sum Weights	6
Mean	1.33333333	Sum Observations	8
Std Deviation	0.51639778	Variance	0.26666667
Skewness	0.96824584	Kurtosis	-1.875
Uncorrected SS	12	Corrected SS	1.33333333
Coeff Variation	38.7298335	Std Error Mean	0.21081851

Basic Statistical Measures

Location		Variability	
Mean	1.333333	Std Deviation	0.51640
Median	1.000000	Variance	0.26667
Mode	1.000000	Range	1.00000
		Interquartile Range	1.00000

Quantiles (Definition 5)

Quantile	Estimate
100% Max	2
99%	2
95%	2
90%	2
75% Q3	2
50% Median	1
25% Q1	1
10%	1
5%	1
1%	1
0% Min	1

Variable: Q8 (Q8)

N	6	Sum Weights	6

Mean	1.33333333	Sum Observations	8
Std Deviation	0.51639778	Variance	0.26666667
Skewness	0.96824584	Kurtosis	-1.875
Uncorrected SS	12	Corrected SS	1.33333333
Coeff Variation	38.7298335	Std Error Mean	0.21081851

Basic Statistical Measures

Location		Variability	
Mean	1.333333	Std Deviation	0.51640
Median	1.000000	Variance	0.26667
Mode	1.000000	Range	1.00000
		Interquartile Range	1.00000

Quantiles (Definition 5)

Quantile	Estimate
100% Max	2
99%	2
95%	2
90%	2
75% Q3	2
50% Median	1
25% Q1	1
10%	1
5%	1
1%	1
0% Min	1

Variable: Q15 (Q15)

N	6	Sum Weights	6
Mean	1.83333333	Sum Observations	11
Std Deviation	1.60208198	Variance	2.56666667
Skewness	2.14817874	Kurtosis	4.63990555
Uncorrected SS	33	Corrected SS	12.8333333
Coeff Variation	87.3862898	Std Error Mean	0.65404723

Basic Statistical Measures

Location		Variability	
Mean	1.833333	Std Deviation	1.60208
Median	1.000000	Variance	2.56667
Mode	1.000000	Range	4.00000
		Interquartile Range	1.00000

Quantiles (Definition 5)

Quantile	Estimate
100% Max	5
99%	5
95%	5
90%	5
75% Q3	2
50% Median	1
25% Q1	1
10%	1
5%	1
1%	1
0% Min	1

Variable: Q16 (Q16)

N	6	Sum Weights	6
Mean	2.83333333	Sum Observations	17
Std Deviation	1.32916014	Variance	1.76666667
Skewness	1.20660674	Kurtosis	-0.4592382
Uncorrected SS	57	Corrected SS	8.83333333
Coeff Variation	46.9115342	Std Error Mean	0.54262735

Basic Statistical Measures

Location		Variability	
Mean	2.833333	Std Deviation	1.32916
Median	2.000000	Variance	1.76667
Mode	2.000000	Range	3.00000
		Interquartile Range	2.00000

Quantiles (Definition 5)

Quantile	Estimate
100% Max	5
99%	5
95%	5
90%	5
75% Q3	4
50% Median	2
25% Q1	2
10%	2
5%	2
1%	2
0% Min	2

Variable: Q17 (Q17)

N	6	Sum Weights	6
Mean	1.83333333	Sum Observations	11
Std Deviation	0.40824829	Variance	0.16666667
Skewness	-2.4494897	Kurtosis	6
Uncorrected SS	21	Corrected SS	0.83333333
Coeff Variation	22.2680886	Std Error Mean	0.16666667

Basic Statistical Measures

Location		Variability	
Mean	1.833333	Std Deviation	0.40825
Median	2.000000	Variance	0.16667
Mode	2.000000	Range	1.00000
		Interquartile Range	0

Quantiles (Definition 5)

Quantile	Estimate
100% Max	2
99%	2
95%	2
90%	2
75% Q3	2
50% Median	2
25% Q1	2
10%	1
5%	1
1%	1
0% Min	1

Variable: Q18 (Q18)

N	6	Sum Weights	6
Mean	3.83333333	Sum Observations	23
Std Deviation	1.32916014	Variance	1.76666667
Skewness	-0.3264936	Kurtosis	-2.253471
Uncorrected SS	97	Corrected SS	8.83333333
Coeff Variation	34.6737427	Std Error Mean	0.54262735

Basic Statistical Measures

Location		Variability	
Mean	3.833333	Std Deviation	1.32916
Median	4.000000	Variance	1.76667
Mode	5.000000	Range	3.00000
		Interquartile Range	2.00000

Quantiles (Definition 5)

Quantile	Estimate
100% Max	5
99%	5
95%	5
90%	5
75% Q3	5
50% Median	4
25% Q1	3
10%	2
5%	2

1%	2
0% Min	2

Variable: Q19 (Q19)

N	6	Sum Weights	6
Mean	3.33333333	Sum Observations	20
Std Deviation	0.81649658	Variance	0.66666667
Skewness	-0.8573214	Kurtosis	-0.3
Uncorrected SS	70	Corrected SS	3.33333333
Coeff Variation	24.4948974	Std Error Mean	0.33333333

Basic Statistical Measures

Location		Variability	
Mean	3.333333	Std Deviation	0.81650
Median	3.500000	Variance	0.66667
Mode	4.000000	Range	2.00000
		Interquartile Range	1.00000

Quantiles (Definition 5)

Quantile	Estimate
100% Max	4.0
99%	4.0
95%	4.0
90%	4.0
75% Q3	4.0
50% Median	3.5
25% Q1	3.0
10%	2.0
5%	2.0
1%	2.0
0% Min	2.0

Variable: Q20 (Q20)

N	6	Sum Weights	6
Mean	2.66666667	Sum Observations	16
Std Deviation	0.81649658	Variance	0.66666667
Skewness	0.85732141	Kurtosis	-0.3
Uncorrected SS	46	Corrected SS	3.33333333
Coeff Variation	30.6186218	Std Error Mean	0.33333333

Basic Statistical Measures

Location		Variability	
Mean	2.666667	Std Deviation	0.81650
Median	2.500000	Variance	0.66667
Mode	2.000000	Range	2.00000
		Interquartile Range	1.00000

Quantiles (Definition 5)

Quantile	Estimate
100% Max	4.0
99%	4.0
95%	4.0
90%	4.0
75% Q3	3.0
50% Median	2.5
25% Q1	2.0
10%	2.0
5%	2.0
1%	2.0
0% Min	2.0

Annexure O:

Descriptive statistics for industryquestionnaire: Uni-variate with means & standard deviations where appropriate

Variable: Q1 (Q1)

N	32	Sum Weights	32
Mean	3.40625	Sum Observations	109
Std Deviation	1.04292934	Variance	1.08770161
Skewness	-0.5532645	Kurtosis	0.20683837
Uncorrected SS	405	Corrected SS	33.71875
Coeff Variation	30.6181091	Std Error Mean	0.1843656

Basic Statistical Measures

Location		Variability	
Mean	3.406250	Std Deviation	1.04293
Median	3.500000	Variance	1.08770
Mode	4.000000	Range	4.00000
		Interquartile Range	1.00000

Quantiles (Definition 5)

Quantile	Estimate
100% Max	5.0
99%	5.0
95%	5.0
90%	5.0
75% Q3	4.0
50% Median	3.5
25% Q1	3.0
10%	2.0
5%	1.0
1%	1.0
0% Min	1.0

Variable: Q2 (Q2)

N	33	Sum Weights	33
Mean	2.06060606	Sum Observations	68
Std Deviation	0.65856824	Variance	0.43371212
Skewness	0.63698138	Kurtosis	1.58074789
Uncorrected SS	154	Corrected SS	13.8787879
Coeff Variation	31.9599291	Std Error Mean	0.11464201

Basic Statistical Measures

Location		Variability	
Mean	2.060606	Std Deviation	0.65857
Median	2.000000	Variance	0.43371
Mode	2.000000	Range	3.00000
		Interquartile Range	0

Quantiles (Definition 5)

Quantile	Estimate
100% Max	4
99%	4
95%	3
90%	3
75% Q3	2
50% Median	2
25% Q1	2
10%	1
5%	1
1%	1
0% Min	1

Variable: Q3 (Q3)

N	32	Sum Weights	32
Mean	3.15625	Sum Observations	101
Std Deviation	0.98731879	Variance	0.97479839
Skewness	-0.5465378	Kurtosis	-0.3425266
Uncorrected SS	349	Corrected SS	30.21875
Coeff Variation	31.2813873	Std Error Mean	0.17453495

Basic Statistical Measures

Location		Variability	
Mean	3.156250	Std Deviation	0.98732
Median	3.000000	Variance	0.97480
Mode	4.000000	Range	4.00000
		Interquartile Range	1.50000

Quantiles (Definition 5)

Quantile	Estimate
100% Max	5.0
99%	5.0
95%	4.0
90%	4.0
75% Q3	4.0
50% Median	3.0
25% Q1	2.5
10%	2.0
5%	1.0
1%	1.0
0% Min	1.0

Variable: Q4 (Q4)

N	32	Sum Weights	32
Mean	3.09375	Sum Observations	99
Std Deviation	0.99545337	Variance	0.99092742
Skewness	-0.8255234	Kurtosis	-0.3529903
Uncorrected SS	337	Corrected SS	30.71875
Coeff Variation	32.1762707	Std Error Mean	0.17597296

Basic Statistical Measures

Location		Variability	
Mean	3.093750	Std Deviation	0.99545
Median	3.000000	Variance	0.99093
Mode	4.000000	Range	3.00000
		Interquartile Range	1.50000

Quantiles (Definition 5)

Quantile	Estimate
100% Max	4.0
99%	4.0
95%	4.0
90%	4.0
75% Q3	4.0
50% Median	3.0
25% Q1	2.5
10%	2.0
5%	1.0
1%	1.0
0% Min	1.0

Variable: Q5 (Q5)

N	33	Sum Weights	33
Mean	2.48484848	Sum Observations	82
Std Deviation	0.93945503	Variance	0.88257576
Skewness	0.28722235	Kurtosis	-0.7642225
Uncorrected SS	232	Corrected SS	28.2424242
Coeff Variation	37.8073367	Std Error Mean	0.16353813

Basic Statistical Measures

Location		Variability	
Mean	2.484848	Std Deviation	0.93946
Median	2.000000	Variance	0.88258
Mode	2.000000	Range	3.00000
		Interquartile Range	1.00000

Quantiles (Definition 5)

Quantile	Estimate
100% Max	4
99%	4

95%	4
90%	4
75% Q3	3
50% Median	2
25% Q1	2
10%	1
5%	1
1%	1
0% Min	1

Variable: Q6 (Q6)

N	33	Sum Weights	33
Mean	2.15151515	Sum Observations	71
Std Deviation	0.79534631	Variance	0.63257576
Skewness	0.90479487	Kurtosis	1.02148355
Uncorrected SS	173	Corrected SS	20.2424242
Coeff Variation	36.9668005	Std Error Mean	0.13845202

Basic Statistical Measures

Location		Variability	
Mean	2.151515	Std Deviation	0.79535
Median	2.000000	Variance	0.63258
Mode	2.000000	Range	3.00000
		Interquartile Range	0

Quantiles (Definition 5)

Quantile	Estimate
100% Max	4
99%	4
95%	4
90%	3
75% Q3	2
50% Median	2
25% Q1	2
10%	1
5%	1
1%	1
0% Min	1

Variable: Q7 (Q7)

N	32	Sum Weights	32
Mean	2.625	Sum Observations	84
Std Deviation	0.90696232	Variance	0.82258065
Skewness	0.57074814	Kurtosis	0.29788013
Uncorrected SS	246	Corrected SS	25.5
Coeff Variation	34.5509454	Std Error Mean	0.1603298

Basic Statistical Measures

Location		Variability	
Mean	2.625000	Std Deviation	0.90696
Median	2.500000	Variance	0.82258
Mode	2.000000	Range	4.00000
		Interquartile Range	1.00000

Quantiles (Definition 5)

Quantile	Estimate
100% Max	5.0
99%	5.0
95%	4.0
90%	4.0
75% Q3	3.0
50% Median	2.5
25% Q1	2.0
10%	2.0
5%	1.0
1%	1.0
0% Min	1.0

Variable: Q8 (Q8)

N	32	Sum Weights	32

Mean	3	Sum Observations	96
Std Deviation	0.91581094	Variance	0.83870968
Skewness	-0.2687824	Kurtosis	0.1372577
Uncorrected SS	314	Corrected SS	26
Coeff Variation	30.5270313	Std Error Mean	0.16189403

Basic Statistical Measures

Location		Variability	
Mean	3.000000	Std Deviation	0.91581
Median	3.000000	Variance	0.83871
Mode	3.000000	Range	4.00000
		Interquartile Range	1.50000

Quantiles (Definition 5)

Quantile	Estimate
100% Max	5.0
99%	5.0
95%	4.0
90%	4.0
75% Q3	4.0
50% Median	3.0
25% Q1	2.5
10%	2.0
5%	1.0
1%	1.0
0% Min	1.0

Variable: Q9 (Q9)

N	33	Sum Weights	33
Mean	2	Sum Observations	66
Std Deviation	1.03077641	Variance	1.0625
Skewness	1.0934813	Kurtosis	1.03833017
Uncorrected SS	166	Corrected SS	34
Coeff Variation	51.5388203	Std Error Mean	0.17943514

Basic Statistical Measures

Location		Variability	
Mean	2.000000	Std Deviation	1.03078
Median	2.000000	Variance	1.06250
Mode	2.000000	Range	4.00000
		Interquartile Range	1.00000

Quantiles (Definition 5)

Quantile	Estimate
100% Max	5
99%	5
95%	4
90%	3
75% Q3	2
50% Median	2
25% Q1	1
10%	1
5%	1
1%	1
0% Min	1

Variable: Q10 (Q10)

N	33	Sum Weights	33
Mean	2.93939394	Sum Observations	97
Std Deviation	0.82686887	Variance	0.68371212
Skewness	-0.2362352	Kurtosis	-0.6784882
Uncorrected SS	307	Corrected SS	21.8787879
Coeff Variation	28.1305903	Std Error Mean	0.14393939

Basic Statistical Measures

Location		Variability	
Mean	2.939394	Std Deviation	0.82687
Median	3.000000	Variance	0.68371
Mode	3.000000	Range	3.00000
		Interquartile Range	2.00000

Quantiles (Definition 5)

Quantile	Estimate
100% Max	4
99%	4
95%	4
90%	4
75% Q3	4
50% Median	3
25% Q1	2
10%	2
5%	2
1%	1
0% Min	1

Variable: Q11 (Q11)

N	33	Sum Weights	33
Mean	1.72727273	Sum Observations	57
Std Deviation	0.80127739	Variance	0.64204545
Skewness	1.32424864	Kurtosis	2.18337657
Uncorrected SS	119	Corrected SS	20.5454545
Coeff Variation	46.3897436	Std Error Mean	0.13948449

Basic Statistical Measures

Location		Variability	
Mean	1.727273	Std Deviation	0.80128
Median	2.000000	Variance	0.64205
Mode	2.000000	Range	3.00000
		Interquartile Range	1.00000

Quantiles (Definition 5)

Quantile	Estimate
100% Max	4
99%	4
95%	4
90%	2
75% Q3	2
50% Median	2
25% Q1	1
10%	1
5%	1
1%	1
0% Min	1

Variable: Q12 (Q12)

N	33	Sum Weights	33
Mean	1.66666667	Sum Observations	55
Std Deviation	0.54006172	Variance	0.29166667
Skewness	-0.0938619	Kurtosis	-0.7425938
Uncorrected SS	101	Corrected SS	9.33333333
Coeff Variation	32.4037035	Std Error Mean	0.09401268

Basic Statistical Measures

Location		Variability	
Mean	1.666667	Std Deviation	0.54006
Median	2.000000	Variance	0.29167
Mode	2.000000	Range	2.00000
		Interquartile Range	1.00000

Quantiles (Definition 5)

Quantile	Estimate
100% Max	3
99%	3
95%	2
90%	2
75% Q3	2
50% Median	2
25% Q1	1
10%	1
5%	1

1%	1
0% Min	1

Variable: Q13 (Q13)

N	33	Sum Weights	33
Mean	1.66666667	Sum Observations	55
Std Deviation	0.69221866	Variance	0.47916667
Skewness	1.158946	Kurtosis	2.571669
Uncorrected SS	107	Corrected SS	15.3333333
Coeff Variation	41.5331193	Std Error Mean	0.1204998

Basic Statistical Measures

Location		Variability	
Mean	1.666667	Std Deviation	0.69222
Median	2.000000	Variance	0.47917
Mode	2.000000	Range	3.00000
		Interquartile Range	1.00000

Quantiles (Definition 5)

Quantile	Estimate
100% Max	4
99%	4
95%	3
90%	2
75% Q3	2
50% Median	2
25% Q1	1
10%	1
5%	1
1%	1
0% Min	1

Variable: Q14 (Q14)

N	33	Sum Weights	33
Mean	1.75757576	Sum Observations	58
Std Deviation	0.93642615	Variance	0.87689394
Skewness	1.00784757	Kurtosis	0.0365007
Uncorrected SS	130	Corrected SS	28.0606061
Coeff Variation	53.279419	Std Error Mean	0.16301087

Basic Statistical Measures

Location		Variability	
Mean	1.757576	Std Deviation	0.93643
Median	1.000000	Variance	0.87689
Mode	1.000000	Range	3.00000
		Interquartile Range	1.00000

Quantiles (Definition 5)

Quantile	Estimate
100% Max	4
99%	4
95%	4
90%	3
75% Q3	2
50% Median	1
25% Q1	1
10%	1
5%	1
1%	1
0% Min	1

Variable: Q15 (Q15)

N	32	Sum Weights	32
Mean	2.71875	Sum Observations	87
Std Deviation	1.19769604	Variance	1.43447581
Skewness	1.06611343	Kurtosis	-0.3153192
Uncorrected SS	281	Corrected SS	44.46875
Coeff Variation	44.0531877	Std Error Mean	0.21172475

Basic Statistical Measures

Location	Variability

Mean	2.718750	Std Deviation	1.19770
Median	2.000000	Variance	1.43448
Mode	2.000000	Range	4.00000
		Interquartile Range	1.50000

Quantiles (Definition 5)

Quantile	Estimate
100% Max	5.0
99%	5.0
95%	5.0
90%	5.0
75% Q3	3.5
50% Median	2.0
25% Q1	2.0
10%	2.0
5%	2.0
1%	1.0
0% Min	1.0

Variable: Q16 (Q16)

N	32	Sum Weights	32
Mean	3.0625	Sum Observations	98
Std Deviation	1.26841277	Variance	1.60887097
Skewness	0.48291167	Kurtosis	-1.2313116
Uncorrected SS	350	Corrected SS	49.875
Coeff Variation	41.41756	Std Error Mean	0.22422582

Basic Statistical Measures

Location		Variability	
Mean	3.062500	Std Deviation	1.26841
Median	3.000000	Variance	1.60887
Mode	2.000000	Range	4.00000
		Interquartile Range	2.00000

Quantiles (Definition 5)

Quantile	Estimate
100% Max	5
99%	5
95%	5
90%	5
75% Q3	4
50% Median	3
25% Q1	2
10%	2
5%	2
1%	1
0% Min	1

Variable: Q17 (Q17)

N	32	Sum Weights	32
Mean	3.53125	Sum Observations	113
Std Deviation	0.98322626	Variance	0.96673387
Skewness	0.01590813	Kurtosis	0.07009639
Uncorrected SS	429	Corrected SS	29.96875
Coeff Variation	27.8435754	Std Error Mean	0.17381149

Basic Statistical Measures

Location		Variability	
Mean	3.531250	Std Deviation	0.98323
Median	3.000000	Variance	0.96673
Mode	3.000000	Range	4.00000
		Interquartile Range	1.00000

Quantiles (Definition 5)

Quantile	Estimate
100% Max	5
99%	5
95%	5
90%	5
75% Q3	4

Quantile	Estimate
50% Median	3
25% Q1	3
10%	3
5%	2
1%	1
0% Min	1

Variable: Q18 (Q18)

N	33	Sum Weights	33
Mean	3.27272727	Sum Observations	108
Std Deviation	0.94448158	Variance	0.89204545
Skewness	0.11747323	Kurtosis	0.24226174
Uncorrected SS	382	Corrected SS	28.5454545
Coeff Variation	28.8591594	Std Error Mean	0.16441314

Basic Statistical Measures

Location		Variability	
Mean	3.272727	Std Deviation	0.94448
Median	3.000000	Variance	0.89205
Mode	3.000000	Range	4.00000
		Interquartile Range	1.00000

Quantiles (Definition 5)

Quantile	Estimate
100% Max	5
99%	5
95%	5
90%	5
75% Q3	4
50% Median	3
25% Q1	3
10%	2
5%	2
1%	1
0% Min	1

Variable: Q19 (Q19)

N	33	Sum Weights	33
Mean	3.3030303	Sum Observations	109
Std Deviation	0.95147414	Variance	0.90530303
Skewness	-0.666362	Kurtosis	-0.5120919
Uncorrected SS	389	Corrected SS	28.969697
Coeff Variation	28.8060977	Std Error Mean	0.16563039

Basic Statistical Measures

Location		Variability	
Mean	3.303030	Std Deviation	0.95147
Median	4.000000	Variance	0.90530
Mode	4.000000	Range	4.00000
		Interquartile Range	1.00000

Quantiles (Definition 5)

Quantile	Estimate
100% Max	5
99%	5
95%	4
90%	4
75% Q3	4
50% Median	4
25% Q1	3
10%	2
5%	2
1%	1
0% Min	1

Variable: Q20 (Q20)

N	33	Sum Weights	33
Mean	2	Sum Observations	66
Std Deviation	0.79056942	Variance	0.625
Skewness	2.01977734	Kurtosis	6.73445161

Uncorrected SS	152	Corrected SS	20
Coeff Variation	39.5284708	Std Error Mean	0.13762047

Basic Statistical Measures

Location		Variability	
Mean	2.000000	Std Deviation	0.79057
Median	2.000000	Variance	0.62500
Mode	2.000000	Range	4.00000
		Interquartile Range	0

Quantiles (Definition 5)

Quantile	Estimate
100% Max	5
99%	5
95%	4
90%	2
75% Q3	2
50% Median	2
25% Q1	2
10%	1
5%	1
1%	1
0% Min	1

Annexure P:
Comparison of proportions for staff questionnaire

Q1	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Mostly agree - Completely agree	4	66.67	4	66.67
Mostly disagree - Completely disagree	2	33.33	6	100.00

Chi-Square Test for Equal Proportions

Chi-Square	0.6667
DF	1
Pr > ChiSq	0.4142

WARNING: The table cells have expected counts less than 5. Chi-Square may not be a valid test.

Sample Size = 6

Q2	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Mostly agree - Completely agree	5	83.33	5	83.33
Mostly disagree - Completely disagree	1	16.67	6	100.00

Chi-Square Test for Equal Proportions

Chi-Square	2.6667
DF	1
Pr > ChiSq	0.1025

WARNING: The table cells have expected counts less than 5. Chi-Square may not be a valid test.

Sample Size = 6

Q3	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Mostly agree - Completely agree	6	100.00	6	100.00

Chi-Square Test for Equal Proportions

Chi-Square	0.0000
DF	0
Pr > ChiSq	.

Sample Size = 6

Q4	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Mostly agree - Completely agree	4	66.67	4	66.67
Undecided	1	16.67	5	83.33
Mostly disagree - Completely disagree	1	16.67	6	100.00

Chi-Square Test for Equal Proportions

Chi-Square	3.0000
DF	2
Pr > ChiSq	0.2231

WARNING: The table cells have expected counts less than 5. Chi-Square may not be a valid test.

Sample Size = 6

Q5	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Mostly agree - Completely agree	4	66.67	4	66.67
Mostly disagree - Completely disagree	2	33.33	6	100.00

Chi-Square Test for Equal Proportions

Chi-Square	0.6667
DF	1
Pr > ChiSq	0.4142

WARNING: The table cells have expected counts less than 5. Chi-Square may not be a valid test.

Sample Size = 6

Q6	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Mostly agree - Completely agree	5	83.33	5	83.33
Mostly disagree - Completely disagree	1	16.67	6	100.00

Chi-Square Test for Equal Proportions

Chi-Square	2.6667
DF	1
Pr > ChiSq	0.1025

WARNING: The table cells have expected counts less than 5. Chi-Square may not be a valid test.

Sample Size = 6

Q7	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Mostly agree - Completely agree	6	100.00	6	100.00

Chi-Square Test for Equal Proportions

Chi-Square	0.0000
DF	0
Pr > ChiSq	.

Sample Size = 6

Q8	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Mostly agree - Completely agree	6	100.00	6	100.00

Chi-Square Test for Equal Proportions

Chi-Square	0.0000
DF	0
Pr > ChiSq	.

Sample Size = 6

Q15	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Mostly agree - Completely agree	5	83.33	5	83.33
Mostly disagree - Completely disagree	1	16.67	6	100.00

Chi-Square Test for Equal Proportions

Chi-Square	2.6667
DF	1
Pr > ChiSq	0.1025

WARNING: The table cells have expected counts less than 5. Chi-Square may not be a valid test.

Sample Size = 6

Q16	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Mostly agree - Completely agree	4	66.67	4	66.67
Mostly disagree - Completely disagree	2	33.33	6	100.00

Chi-Square Test for Equal Proportions

Chi-Square	0.6667
DF	1
Pr > ChiSq	0.4142

WARNING: The table cells have expected counts less than 5. Chi-Square may not be a valid test.

Sample Size = 6

Cumulative Cumulative

Q17	Frequency	Percent	Frequency	Percent
Mostly agree - Completely agree	6	100.00	6	100.00

Chi-Square Test
for Equal Proportions

Chi-Square	0.0000
DF	0
Pr > ChiSq	.

Sample Size = 6

Q18	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Mostly agree - Completely agree	1	16.67	1	16.67
Undecided	2	33.33	3	50.00
Mostly disagree - Completely disagree	3	50.00	6	100.00

Chi-Square Test
for Equal Proportions

Chi-Square	1.0000
DF	2
Pr > ChiSq	0.6065

WARNING: The table cells have expected counts less
than 5. Chi-Square may not be a valid test.
Sample Size = 6

Q19	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Mostly agree - Completely agree	1	16.67	1	16.67
Undecided	2	33.33	3	50.00
Mostly disagree - Completely disagree	3	50.00	6	100.00

Chi-Square Test
for Equal Proportions

Chi-Square	1.0000
DF	2
Pr > ChiSq	0.6065

WARNING: The table cells have expected counts less
than 5. Chi-Square may not be a valid test.
Sample Size = 6

Q20	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Mostly agree - Completely agree	3	50.00	3	50.00
Undecided	2	33.33	5	83.33
Mostly disagree - Completely disagree	1	16.67	6	100.00

Chi-Square Test
for Equal Proportions

Chi-Square	1.0000
DF	2
Pr > ChiSq	0.6065

WARNING: The table cells have expected counts less
than 5. Chi-Square may not be a valid test.
Sample Size = 6

Annexure Q:
Comparison of proportions for industry questionnaire

Q1	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Mostly agree - Completely agree	5	15.63	5	15.63
Undecided	11	34.38	16	50.00
Mostly disagree - Completely disagree	16	50.00	32	100.00

Chi-Square Test for Equal Proportions

Chi-Square	5.6875
DF	2
Pr > ChiSq	0.0582

Effective Sample Size = 32
Frequency Missing = 1

Q2	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Mostly agree - Completely agree	27	81.82	27	81.82
Undecided	5	15.15	32	96.97
Mostly disagree - Completely disagree	1	3.03	33	100.00

Chi-Square Test for Equal Proportions

Chi-Square	35.6364
DF	2
Pr > ChiSq	<.0001

Sample Size = 33

Q3	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Mostly agree - Completely agree	8	25.00	8	25.00
Undecided	10	31.25	18	56.25
Mostly disagree - Completely disagree	14	43.75	32	100.00

Chi-Square Test for Equal Proportions

Chi-Square	1.7500
DF	2
Pr > ChiSq	0.4169

Effective Sample Size = 32
Frequency Missing = 1

Q4	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Mostly agree - Completely agree	8	25.00	8	25.00
Undecided	10	31.25	18	56.25
Mostly disagree - Completely disagree	14	43.75	32	100.00

Chi-Square Test for Equal Proportions

Chi-Square	1.7500
DF	2
Pr > ChiSq	0.4169

Effective Sample Size = 32
Frequency Missing = 1

Q5	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Mostly agree - Completely agree	19	57.58	19	57.58
Undecided	8	24.24	27	81.82
Mostly disagree - Completely disagree	6	18.18	33	100.00

Chi-Square Test for Equal Proportions

Chi-Square	8.9091
DF	2

Pr > ChiSq	0.0116

Sample Size = 33

Q6	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Mostly agree - Completely agree	26	78.79	26	78.79
Undecided	4	12.12	30	90.91
Mostly disagree - Completely disagree	3	9.09	33	100.00

Chi-Square Test for Equal Proportions

Chi-Square	30.7273
DF	2
Pr > ChiSq	<.0001

Sample Size = 33

Q7	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Mostly agree - Completely agree	16	50.00	16	50.00
Undecided	11	34.38	27	84.38
Mostly disagree - Completely disagree	5	15.63	32	100.00

Chi-Square Test for Equal Proportions

Chi-Square	5.6875
DF	2
Pr > ChiSq	0.0582

Effective Sample Size = 32
Frequency Missing = 1

Q8	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Mostly agree - Completely agree	8	25.00	8	25.00
Undecided	15	46.88	23	71.88
Mostly disagree - Completely disagree	9	28.13	32	100.00

Chi-Square Test for Equal Proportions

Chi-Square	2.6875
DF	2
Pr > ChiSq	0.2609

Effective Sample Size = 32
Frequency Missing = 1

Q9	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Mostly agree - Completely agree	25	75.76	25	75.76
Undecided	5	15.15	30	90.91
Mostly disagree - Completely disagree	3	9.09	33	100.00

Chi-Square Test for Equal Proportions

Chi-Square	26.9091
DF	2
Pr > ChiSq	<.0001

Sample Size = 33

Q10	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Mostly agree - Completely agree	10	30.30	10	30.30
Undecided	14	42.42	24	72.73
Mostly disagree - Completely disagree	9	27.27	33	100.00

Chi-Square Test for Equal Proportions

Chi-Square	1.2727
DF	2
Pr > ChiSq	0.5292

Sample Size = 33

Q11	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Mostly agree - Completely agree	30	90.91	30	90.91
Undecided	1	3.03	31	93.94
Mostly disagree - Completely disagree	2	6.06	33	100.00

Chi-Square Test for Equal Proportions

Chi-Square	49.2727
DF	2
Pr > ChiSq	<.0001

Sample Size = 33

Q12	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Mostly agree - Completely agree	32	96.97	32	96.97
Undecided	1	3.03	33	100.00

Chi-Square Test for Equal Proportions

Chi-Square	29.1212
DF	1
Pr > ChiSq	<.0001

Sample Size = 33

Q13	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Mostly agree - Completely agree	31	93.94	31	93.94
Undecided	1	3.03	32	96.97
Mostly disagree - Completely disagree	1	3.03	33	100.00

Chi-Square Test for Equal Proportions

Chi-Square	54.5455
DF	2
Pr > ChiSq	<.0001

Sample Size = 33

Q14	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Mostly agree - Completely agree	26	78.79	26	78.79
Undecided	5	15.15	31	93.94
Mostly disagree - Completely disagree	2	6.06	33	100.00

Chi-Square Test for Equal Proportions

Chi-Square	31.0909
DF	2
Pr > ChiSq	<.0001

Sample Size = 33

Q15	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Mostly agree - Completely agree	21	65.63	21	65.63
Undecided	3	9.38	24	75.00
Mostly disagree - Completely disagree	8	25.00	32	100.00

Chi-Square Test for Equal Proportions

Chi-Square	16.1875
DF	2
Pr > ChiSq	0.0003

Effective Sample Size = 32

Frequency Missing = 1

Q16	Frequency	Percent	Cumulative Frequency	Cumulative Percent

Mostly agree - Completely agree	15	46.88	15	46.88
Undecided	6	18.75	21	65.63
Mostly disagree - Completely disagree	11	34.38	32	100.00

Chi-Square Test
for Equal Proportions

Chi-Square	3.8125
DF	2
Pr > ChiSq	0.1486

Effective Sample Size = 32
Frequency Missing = 1

Q17	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Mostly agree - Completely agree	2	6.25	2	6.25
Undecided	17	53.13	19	59.38
Mostly disagree - Completely disagree	13	40.63	32	100.00

Chi-Square Test
for Equal Proportions

Chi-Square	11.3125
DF	2
Pr > ChiSq	0.0035

Effective Sample Size = 32
Frequency Missing = 1

Q18	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Mostly agree - Completely agree	5	15.15	5	15.15
Undecided	17	51.52	22	66.67
Mostly disagree - Completely disagree	11	33.33	33	100.00

Chi-Square Test
for Equal Proportions

Chi-Square	6.5455
DF	2
Pr > ChiSq	0.0379

Sample Size = 33

Q19	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Mostly agree - Completely agree	8	24.24	8	24.24
Undecided	7	21.21	15	45.45
Mostly disagree - Completely disagree	18	54.55	33	100.00

Chi-Square Test
for Equal Proportions

Chi-Square	6.7273
DF	2
Pr > ChiSq	0.0346

Sample Size = 33

Q20	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Mostly agree - Completely agree	30	90.91	30	90.91
Undecided	1	3.03	31	93.94
Mostly disagree - Completely disagree	2	6.06	33	100.00

Chi-Square Test
for Equal Proportions

Chi-Square	49.2727
DF	2
Pr > ChiSq	<.0001

Sample Size = 33

Annexure R:
Chi-square test for comparisons

Table of GROUP by Q7n

Frequency / Percent / Row Pct / Col Pct	Mostly agree - Completely agree	Undecided	Mostly disagree - Completely disagree	Total
Staff	4	0	2	6
	10.53	0.00	5.26	15.79
	66.67	0.00	33.33	
	20.00	0.00	28.57	
Industry	16	11	5	32
	42.11	28.95	13.16	84.21
	50.00	34.38	15.63	
	80.00	100.00	71.43	
Total	20	11	7	38
	52.63	28.95	18.42	100.00

Statistics for Table of GROUP by Q7n

Statistic	DF	Value	Prob
Chi-Square	2	3.1893	0.2030
Likelihood Ratio Chi-Square	2	4.7565	0.0927
Mantel-Haenszel Chi-Square	1	0.0782	0.7797
Phi Coefficient		0.2897	
Contingency Coefficient		0.2783	
Cramer's V		0.2897	

WARNING: 50% of the cells have expected counts less than 5. Chi-Square may not be a valid test.

Sample Size = 38

Table of GROUP by Q8n

Frequency / Percent / Row Pct / Col Pct	Mostly agree - Completely agree	Undecided	Mostly disagree - Completely disagree	Total
Staff	5	0	1	6
	13.16	0.00	2.63	15.79
	83.33	0.00	16.67	
	38.46	0.00	10.00	
Industry	8	15	9	32
	21.05	39.47	23.68	84.21
	25.00	46.88	28.13	
	61.54	100.00	90.00	
Total	13	15	10	38
	34.21	39.47	26.32	100.00

Statistics for Table of GROUP by Q8n

Statistic	DF	Value	Prob
Chi-Square	2	8.0902	0.0175
Likelihood Ratio Chi-Square	2	9.3234	0.0095
Mantel-Haenszel Chi-Square	1	5.5533	0.0184

```
Phi Coefficient                       0.4614
Contingency Coefficient               0.4190
Cramer's V                            0.4614
 WARNING: 50% of the cells have expected counts less
          than 5. Chi-Square may not be a valid test.
                   Sample Size = 38

                Table of GROUP by Q9n
     Frequency,
     Percent  ,
     Row Pct  ,
     Col Pct  ,Mostly a,Undecide,Mostly d,  Total
              ,gree - C,d       ,isagree ,
              ,ompletel,        ,- Comple,
              ,y agree ,        ,tely dis,
              ,        ,        ,agree   ,
     ƒƒƒƒƒƒƒƒƒˆƒƒƒƒƒƒƒƒˆƒƒƒƒƒƒƒƒˆƒƒƒƒƒƒƒƒˆ
     Staff    ,      6 ,      0 ,      0 ,      6
              ,  15.79 ,   0.00 ,   0.00 ,  15.79
              , 100.00 ,   0.00 ,   0.00 ,
              ,  20.00 ,   0.00 ,   0.00 ,
     ƒƒƒƒƒƒƒƒƒˆƒƒƒƒƒƒƒƒˆƒƒƒƒƒƒƒƒˆƒƒƒƒƒƒƒƒˆ
     Industry ,     24 ,      5 ,      3 ,     32
              ,  63.16 ,  13.16 ,   7.89 ,  84.21
              ,  75.00 ,  15.63 ,   9.38 ,
              ,  80.00 , 100.00 , 100.00 ,
     ƒƒƒƒƒƒƒƒƒˆƒƒƒƒƒƒƒƒˆƒƒƒƒƒƒƒƒˆƒƒƒƒƒƒƒƒˆ
     Total          30        5        3       38
                 78.95    13.16     7.89   100.00

         Statistics for Table of GROUP by Q9n
Statistic                     DF       Value      Prob
ƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒ
Chi-Square                     2      1.9000    0.3867
Likelihood Ratio Chi-Square    2      3.1242    0.2097
Mantel-Haenszel Chi-Square     1      1.7575    0.1849
Phi Coefficient                       0.2236
Contingency Coefficient               0.2182
Cramer's V                            0.2236
 WARNING: 83% of the cells have expected counts less
          than 5. Chi-Square may not be a valid test.
                   Sample Size = 38

                Table of GROUP by Q10n
     Frequency,
     Percent  ,
     Row Pct  ,
     Col Pct  ,Mostly a,Undecide,Mostly d,  Total
              ,gree - C,d       ,isagree ,
              ,ompletel,        ,- Comple,
              ,y agree ,        ,tely dis,
              ,        ,        ,agree   ,
     ƒƒƒƒƒƒƒƒƒˆƒƒƒƒƒƒƒƒˆƒƒƒƒƒƒƒƒˆƒƒƒƒƒƒƒƒˆ
     Staff    ,      4 ,      1 ,      1 ,      6
              ,  10.53 ,   2.63 ,   2.63 ,  15.79
              ,  66.67 ,  16.67 ,  16.67 ,
              ,  28.57 ,   7.14 ,  10.00 ,
     ƒƒƒƒƒƒƒƒƒˆƒƒƒƒƒƒƒƒˆƒƒƒƒƒƒƒƒˆƒƒƒƒƒƒƒƒˆ
     Industry ,     10 ,     13 ,      9 ,     32
              ,  26.32 ,  34.21 ,  23.68 ,  84.21
              ,  31.25 ,  40.63 ,  28.13 ,
              ,  71.43 ,  92.86 ,  90.00 ,
     ƒƒƒƒƒƒƒƒƒˆƒƒƒƒƒƒƒƒˆƒƒƒƒƒƒƒƒˆƒƒƒƒƒƒƒƒˆ
     Total          14       14       10       38
                 36.84    36.84    26.32   100.00

        Statistics for Table of GROUP by Q10n
Statistic                     DF       Value      Prob
ƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒ
```

Chi-Square	2	2.7595	0.2516
Likelihood Ratio Chi-Square	2	2.6902	0.2605
Mantel-Haenszel Chi-Square	1	2.2027	0.1378
Phi Coefficient		0.2695	
Contingency Coefficient		0.2602	
Cramer's V		0.2695	

WARNING: 50% of the cells have expected counts less than 5. Chi-Square may not be a valid test.

Sample Size = 38

Table of GROUP by Q11n

Frequency, Percent, Row Pct, Col Pct	Mostly agree - Completely agree	Undecided	Mostly disagree - Completely disagree	Total
Staff	4	0	2	6
	10.53	0.00	5.26	15.79
	66.67	0.00	33.33	
	12.12	0.00	50.00	
Industry	29	1	2	32
	76.32	2.63	5.26	84.21
	90.63	3.13	6.25	
	87.88	100.00	50.00	
Total	33	1	4	38
	86.84	2.63	10.53	100.00

Statistics for Table of GROUP by Q11n

Statistic	DF	Value	Prob
Chi-Square	2	4.0423	0.1325
Likelihood Ratio Chi-Square	2	3.2272	0.1992
Mantel-Haenszel Chi-Square	1	3.0181	0.0823
Phi Coefficient		0.3262	
Contingency Coefficient		0.3101	
Cramer's V		0.3262	

WARNING: 67% of the cells have expected counts less than 5. Chi-Square may not be a valid test.

Sample Size = 38

Table of GROUP by Q12n

Frequency, Percent, Row Pct, Col Pct	Mostly agree - Completely agree	Undecided	Mostly disagree - Completely disagree	Total
Staff	5	0	1	6
	13.16	0.00	2.63	15.79
	83.33	0.00	16.67	
	13.89	0.00	100.00	
Industry	31	1	0	32
	81.58	2.63	0.00	84.21
	96.88	3.13	0.00	
	86.11	100.00	0.00	
Total	36	1	1	38
	94.74	2.63	2.63	100.00

```
        Statistics for Table of GROUP by Q12n
Statistic                     DF       Value      Prob
ƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒ
Chi-Square                     2      5.6186    0.0602
Likelihood Ratio Chi-Square    2      4.1366    0.1264
Mantel-Haenszel Chi-Square     1      3.5816    0.0584
Phi Coefficient                       0.3845
Contingency Coefficient               0.3589
Cramer's V                            0.3845
 WARNING: 67% of the cells have expected counts less
          than 5. Chi-Square may not be a valid test.
                   Sample Size = 38

                Table of GROUP by Q13n
     Frequency,
     Percent  ,
     Row Pct  ,
     Col Pct  ,Mostly a,Undecide,Mostly d,  Total
              ,gree - C,d       ,isagree ,
              ,ompletel,        ,- Comple,
              ,y agree ,        ,tely dis,
              ,        ,        ,agree   ,
     ƒƒƒƒƒƒƒƒƒˆƒƒƒƒƒƒƒƒˆƒƒƒƒƒƒƒƒˆƒƒƒƒƒƒƒƒˆ
     Staff    ,      6 ,      0 ,      0 ,      6
              ,  15.79 ,   0.00 ,   0.00 ,  15.79
              , 100.00 ,   0.00 ,   0.00 ,
              ,  16.67 ,   0.00 ,   0.00 ,
     ƒƒƒƒƒƒƒƒƒˆƒƒƒƒƒƒƒƒˆƒƒƒƒƒƒƒƒˆƒƒƒƒƒƒƒƒˆ
     Industry ,     30 ,      1 ,      1 ,     32
              ,  78.95 ,   2.63 ,   2.63 ,  84.21
              ,  93.75 ,   3.13 ,   3.13 ,
              ,  83.33 , 100.00 , 100.00 ,
     ƒƒƒƒƒƒƒƒƒˆƒƒƒƒƒƒƒƒˆƒƒƒƒƒƒƒƒˆƒƒƒƒƒƒƒƒˆ
     Total          36        1        1       38
                 94.74     2.63     2.63   100.00

        Statistics for Table of GROUP by Q13n
Statistic                     DF       Value      Prob
ƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒ
Chi-Square                     2      0.3958    0.8204
Likelihood Ratio Chi-Square    2      0.7079    0.7019
Mantel-Haenszel Chi-Square     1      0.3698    0.5431
Phi Coefficient                       0.1021
Contingency Coefficient               0.1015
Cramer's V                            0.1021
 WARNING: 67% of the cells have expected counts less
          than 5. Chi-Square may not be a valid test.
                   Sample Size = 38

                Table of GROUP by Q14n
     Frequency,
     Percent  ,
     Row Pct  ,
     Col Pct  ,Mostly a,Undecide,Mostly d,  Total
              ,gree - C,d       ,isagree ,
              ,ompletel,        ,- Comple,
              ,y agree ,        ,tely dis,
              ,        ,        ,agree   ,
     ƒƒƒƒƒƒƒƒƒˆƒƒƒƒƒƒƒƒˆƒƒƒƒƒƒƒƒˆƒƒƒƒƒƒƒƒˆ
     Staff    ,      6 ,      0 ,      0 ,      6
              ,  15.79 ,   0.00 ,   0.00 ,  15.79
              , 100.00 ,   0.00 ,   0.00 ,
              ,  18.75 ,   0.00 ,   0.00 ,
     ƒƒƒƒƒƒƒƒƒˆƒƒƒƒƒƒƒƒˆƒƒƒƒƒƒƒƒˆƒƒƒƒƒƒƒƒˆ
     Industry ,     26 ,      4 ,      2 ,     32
              ,  68.42 ,  10.53 ,   5.26 ,  84.21
              ,  81.25 ,  12.50 ,   6.25 ,
              ,  81.25 , 100.00 , 100.00 ,
     ƒƒƒƒƒƒƒƒƒˆƒƒƒƒƒƒƒƒˆƒƒƒƒƒƒƒƒˆƒƒƒƒƒƒƒƒˆ
```

Total	32	4	2	38
	84.21	10.53	5.26	100.00

Statistics for Table of GROUP by Q14n

Statistic	DF	Value	Prob
Chi-Square	2	1.3359	0.5127
Likelihood Ratio Chi-Square	2	2.2634	0.3225
Mantel-Haenszel Chi-Square	1	1.2406	0.2653
Phi Coefficient		0.1875	
Contingency Coefficient		0.1843	
Cramer's V		0.1875	

WARNING: 67% of the cells have expected counts less than 5. Chi-Square may not be a valid test.

Sample Size = 38

Table of GROUP by Q15n

Frequency, Percent, Row Pct, Col Pct	Mostly agree - Completely agree	Undecided	Mostly disagree - Completely disagree	Total
Staff	5	0	1	6
	13.16	0.00	2.63	15.79
	83.33	0.00	16.67	
	19.23	0.00	11.11	
Industry	21	3	8	32
	55.26	7.89	21.05	84.21
	65.63	9.38	25.00	
	80.77	100.00	88.89	
Total	26	3	9	38
	68.42	7.89	23.68	100.00

Statistics for Table of GROUP by Q15n

Statistic	DF	Value	Prob
Chi-Square	2	0.9422	0.6243
Likelihood Ratio Chi-Square	2	1.4127	0.4935
Mantel-Haenszel Chi-Square	1	0.5561	0.4558
Phi Coefficient		0.1575	
Contingency Coefficient		0.1555	
Cramer's V		0.1575	

WARNING: 67% of the cells have expected counts less than 5. Chi-Square may not be a valid test.

Sample Size = 38

Table of GROUP by Q16n

Frequency, Percent, Row Pct, Col Pct	Mostly agree - Completely agree	Undecided	Mostly disagree - Completely disagree	Total
Staff	4	0	2	6
	10.53	0.00	5.26	15.79
	66.67	0.00	33.33	
	21.05	0.00	15.38	
Industry	15	6	11	32
	39.47	15.79	28.95	84.21

```
              ,  46.88 ,  18.75 ,  34.38 ,
              ,  78.95 , 100.00 ,  84.62 ,
     ƒƒƒƒƒƒƒƒƒˆƒƒƒƒƒƒƒƒˆƒƒƒƒƒƒƒƒˆƒƒƒƒƒƒƒƒˆ
     Total          19        6       13       38
                 50.00    15.79    34.21   100.00

        Statistics for Table of GROUP by Q16n
Statistic                     DF       Value      Prob
ƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒ
Chi-Square                     2      1.5224    0.4671
Likelihood Ratio Chi-Square    2      2.4291    0.2968
Mantel-Haenszel Chi-Square     1      0.4253    0.5143
Phi Coefficient                       0.2002
Contingency Coefficient               0.1963
Cramer's V                            0.2002
 WARNING: 50% of the cells have expected counts less
          than 5. Chi-Square may not be a valid test.
                   Sample Size = 38

                Table of GROUP by Q17n
     Frequency,
     Percent  ,
     Row Pct  ,
     Col Pct  ,Mostly a,Undecide,Mostly d,  Total
              ,gree - C,d       ,isagree ,
              ,ompletel,        ,- Comple,
              ,y agree ,        ,tely dis,
              ,        ,        ,agree   ,
     ƒƒƒƒƒƒƒƒƒˆƒƒƒƒƒƒƒƒˆƒƒƒƒƒƒƒƒˆƒƒƒƒƒƒƒƒˆ
     Staff    ,      6 ,      0 ,      0 ,      6
              ,  15.79 ,   0.00 ,   0.00 ,  15.79
              , 100.00 ,   0.00 ,   0.00 ,
              ,  75.00 ,   0.00 ,   0.00 ,
     ƒƒƒƒƒƒƒƒƒˆƒƒƒƒƒƒƒƒˆƒƒƒƒƒƒƒƒˆƒƒƒƒƒƒƒƒˆ
     Industry ,      2 ,     17 ,     13 ,     32
              ,   5.26 ,  44.74 ,  34.21 ,  84.21
              ,   6.25 ,  53.13 ,  40.63 ,
              ,  25.00 , 100.00 , 100.00 ,
     ƒƒƒƒƒƒƒƒƒˆƒƒƒƒƒƒƒƒˆƒƒƒƒƒƒƒƒˆƒƒƒƒƒƒƒƒˆ
     Total           8       17       13       38
                 21.05    44.74    34.21   100.00

        Statistics for Table of GROUP by Q17n
Statistic                     DF       Value      Prob
ƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒ
Chi-Square                     2     26.7188    <.0001
Likelihood Ratio Chi-Square    2     24.1510    <.0001
Mantel-Haenszel Chi-Square     1     21.7342    <.0001
Phi Coefficient                       0.8385
Contingency Coefficient               0.6425
Cramer's V                            0.8385
 WARNING: 50% of the cells have expected counts less
          than 5. Chi-Square may not be a valid test.
                   Sample Size = 38

                Table of GROUP by Q18n
     Frequency,
     Percent  ,
     Row Pct  ,
     Col Pct  ,Mostly a,Undecide,Mostly d,  Total
              ,gree - C,d       ,isagree ,
              ,ompletel,        ,- Comple,
              ,y agree ,        ,tely dis,
              ,        ,        ,agree   ,
     ƒƒƒƒƒƒƒƒƒˆƒƒƒƒƒƒƒƒˆƒƒƒƒƒƒƒƒˆƒƒƒƒƒƒƒƒˆ
     Staff    ,      1 ,      2 ,      3 ,      6
              ,   2.63 ,   5.26 ,   7.89 ,  15.79
              ,  16.67 ,  33.33 ,  50.00 ,
              ,  20.00 ,  10.53 ,  21.43 ,
```

```
     ƒƒƒƒƒƒƒƒƒˆƒƒƒƒƒƒƒƒˆƒƒƒƒƒƒƒƒˆƒƒƒƒƒƒƒƒˆ
     Industry ,      4 ,     17 ,     11 ,     32
              ,  10.53 ,  44.74 ,  28.95 ,  84.21
              ,  12.50 ,  53.13 ,  34.38 ,
              ,  80.00 ,  89.47 ,  78.57 ,
     ƒƒƒƒƒƒƒƒƒˆƒƒƒƒƒƒƒƒˆƒƒƒƒƒƒƒƒˆƒƒƒƒƒƒƒƒˆ
     Total           5       19       14       38
                 13.16    50.00    36.84   100.00

        Statistics for Table of GROUP by Q18n
Statistic                     DF       Value      Prob
ƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒ
Chi-Square                     2      0.7973    0.6712
Likelihood Ratio Chi-Square    2      0.8092    0.6672
Mantel-Haenszel Chi-Square     1      0.0296    0.8634
Phi Coefficient                       0.1449
Contingency Coefficient               0.1434
Cramer's V                            0.1449
 WARNING: 67% of the cells have expected counts less
          than 5. Chi-Square may not be a valid test.
                   Sample Size = 38

                Table of GROUP by Q19n
     Frequency,
     Percent  ,
     Row Pct  ,
     Col Pct  ,Mostly a,Undecide,Mostly d,  Total
              ,gree - C,d       ,isagree ,
              ,ompletel,        ,- Comple,
              ,y agree ,        ,tely dis,
              ,        ,        ,agree   ,
     ƒƒƒƒƒƒƒƒƒˆƒƒƒƒƒƒƒƒˆƒƒƒƒƒƒƒƒˆƒƒƒƒƒƒƒƒˆ
     Staff    ,      1 ,      2 ,      3 ,      6
              ,   2.63 ,   5.26 ,   7.89 ,  15.79
              ,  16.67 ,  33.33 ,  50.00 ,
              ,  11.11 ,  25.00 ,  14.29 ,
     ƒƒƒƒƒƒƒƒƒˆƒƒƒƒƒƒƒƒˆƒƒƒƒƒƒƒƒˆƒƒƒƒƒƒƒƒˆ
     Industry ,      8 ,      6 ,     18 ,     32
              ,  21.05 ,  15.79 ,  47.37 ,  84.21
              ,  25.00 ,  18.75 ,  56.25 ,
              ,  88.89 ,  75.00 ,  85.71 ,
     ƒƒƒƒƒƒƒƒƒˆƒƒƒƒƒƒƒƒˆƒƒƒƒƒƒƒƒˆƒƒƒƒƒƒƒƒˆ
     Total           9        8       21       38
                 23.68    21.05    55.26   100.00

        Statistics for Table of GROUP by Q19n
Statistic                     DF       Value      Prob
ƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒ
Chi-Square                     2      0.6943    0.7067
Likelihood Ratio Chi-Square    2      0.6471    0.7236
Mantel-Haenszel Chi-Square     1      0.0357    0.8501
Phi Coefficient                       0.1352
Contingency Coefficient               0.1340
Cramer's V                            0.1352
 WARNING: 50% of the cells have expected counts less
          than 5. Chi-Square may not be a valid test.
                   Sample Size = 38

                Table of GROUP by Q20n
     Frequency,
     Percent  ,
     Row Pct  ,
     Col Pct  ,Mostly a,Undecide,Mostly d,  Total
              ,gree - C,d       ,isagree ,
              ,ompletel,        ,- Comple,
              ,y agree ,        ,tely dis,
              ,        ,        ,agree   ,
     ƒƒƒƒƒƒƒƒƒˆƒƒƒƒƒƒƒƒˆƒƒƒƒƒƒƒƒˆƒƒƒƒƒƒƒƒˆ
     Staff    ,      3 ,      2 ,      1 ,      6
```

```
         ,   7.89 ,   5.26 ,   2.63 ,  15.79
         ,  50.00 ,  33.33 ,  16.67 ,
         ,   9.38 ,  66.67 ,  33.33 ,
ƒƒƒƒƒƒƒƒƒˆƒƒƒƒƒƒƒƒˆƒƒƒƒƒƒƒƒˆƒƒƒƒƒƒƒƒˆ
Industry ,     29 ,      1 ,      2 ,     32
         ,  76.32 ,   2.63 ,   5.26 ,  84.21
         ,  90.63 ,   3.13 ,   6.25 ,
         ,  90.63 ,  33.33 ,  66.67 ,
ƒƒƒƒƒƒƒƒƒˆƒƒƒƒƒƒƒƒˆƒƒƒƒƒƒƒƒˆƒƒƒƒƒƒƒƒˆ
Total          32        3        3       38
            84.21     7.89     7.89   100.00
```

```
        Statistics for Table of GROUP by Q20n
Statistic                     DF       Value      Prob
ƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒ
Chi-Square                     2      7.5250    0.0232
Likelihood Ratio Chi-Square    2      5.5979    0.0609
Mantel-Haenszel Chi-Square     1      4.7489    0.0293
Phi Coefficient                       0.4450
Contingency Coefficient               0.4066
Cramer's V                            0.4450
 WARNING: 67% of the cells have expected counts less
          than 5. Chi-Square may not be a valid test.
                   Sample Size = 38
```

Annexure S:
ANOVA & Man Whitney test

```
                 Analysis of Variance for Variable CRIT
                      Classified by Variable GROUP
                 GROUP              N              Mean
                 ƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒ
                 Staff              6          7.666667
                 Industry          32         10.562500

  Source    DF    Sum of Squares    Mean Square     F Value    Pr > F
  ƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒ
  Among      1         42.370614      42.370614     10.9573    0.0021
  Within    36        139.208333       3.866898

             Wilcoxon Scores (Rank Sums) for Variable CRIT
                      Classified by Variable GROUP
                        Sum of      Expected       Std Dev          Mean
GROUP          N        Scores      Under H0      Under H0         Score
ƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒ
Staff          6         45.50         117.0     24.707910      7.583333
Industry      32        695.50         624.0     24.707910     21.734375
                   Average scores were used for ties.

                       Wilcoxon Two-Sample Test
                     Statistic             45.5000
                     Normal Approximation
                     Z                     -2.8736
                     One-Sided Pr <  Z      0.0020
                     Two-Sided Pr > |Z|     0.0041

                     t Approximation
                     One-Sided Pr <  Z      0.0033
                     Two-Sided Pr > |Z|     0.0067
                 Z includes a continuity correction of 0.5.


                          Kruskal-Wallis Test
                     Chi-Square             8.3741
                     DF                          1
                     Pr > Chi-Square        0.0038


                 Analysis of Variance for Variable KEYE
                      Classified by Variable GROUP
                 GROUP              N              Mean
                 ƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒ
                 Staff              6          7.333333
                 Industry          32          6.750000

  Source    DF    Sum of Squares    Mean Square     F Value    Pr > F
  ƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒ
  Among      1          1.719298       1.719298      0.3451    0.5605
  Within    36        179.333333       4.981481

             Wilcoxon Scores (Rank Sums) for Variable KEYE
                      Classified by Variable GROUP
                        Sum of      Expected       Std Dev          Mean
GROUP          N        Scores      Under H0      Under H0         Score
ƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒ
Staff          6        130.50         117.0     24.595736     21.750000
Industry      32        610.50         624.0     24.595736     19.078125
                   Average scores were used for ties.

                        Wilcoxon Two-Sample Test
                     Statistic            130.5000
                     Normal Approximation
                     Z                      0.5285
```

One-Sided Pr > Z 0.2986
Two-Sided Pr > |Z| 0.5971

t Approximation
One-Sided Pr > Z 0.3001
Two-Sided Pr > |Z| 0.6003
Z includes a continuity correction of 0.5.

Kruskal-Wallis Test

Chi-Square	0.3013
DF	1
Pr > Chi-Square	0.5831

Analysis of Variance for Variable KNOW
Classified by Variable GROUP

GROUP	N	Mean
Staff	6	16.333333
Industry	32	17.937500

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Among	1	13.002193	13.002193	0.7535	0.3911
Within	36	621.208333	17.255787		

Wilcoxon Scores (Rank Sums) for Variable KNOW
Classified by Variable GROUP

GROUP	N	Sum of Scores	Expected Under H0	Std Dev Under H0	Mean Score
Staff	6	87.0	117.0	24.767252	14.50000
Industry	32	654.0	624.0	24.767252	20.43750

Average scores were used for ties.

Wilcoxon Two-Sample Test
Statistic 87.0000
Normal Approximation
Z -1.1911
One-Sided Pr < Z 0.1168
Two-Sided Pr > |Z| 0.2336

t Approximation
One-Sided Pr < Z 0.1206
Two-Sided Pr > |Z| 0.2412
Z includes a continuity correction of 0.5.

Kruskal-Wallis Test

Chi-Square	1.4672
DF	1
Pr > Chi-Square	0.2258

Analysis of Variance for Variable CRITM
Classified by Variable GROUP

GROUP	N	Mean
Staff	6	1.916667
Industry	32	2.640625

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Among	1	2.648163	2.648163	10.9573	0.0021
Within	36	8.700521	0.241681		

Wilcoxon Scores (Rank Sums) for Variable CRITM
Classified by Variable GROUP

GROUP	N	Sum of Scores	Expected Under H0	Std Dev Under H0	Mean Score

Staff	6	45.50	117.0	24.707910	7.583333
Industry	32	695.50	624.0	24.707910	21.734375

Wilcoxon Two-Sample Test

Statistic 45.5000

Normal Approximation

Z -2.8736

One-Sided Pr < Z 0.0020

Two-Sided Pr > |Z| 0.0041

t Approximation

One-Sided Pr < Z 0.0033

Two-Sided Pr > |Z| 0.0067

Z includes a continuity correction of 0.5.

Kruskal-Wallis Test

Chi-Square 8.3741

DF 1

Pr > Chi-Square 0.0038

Analysis of Variance for Variable KEYEM
Classified by Variable GROUP

GROUP	N	Mean
Staff	6	1.833333
Industry	32	1.687500

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Among	1	0.107456	0.107456	0.3451	0.5605
Within	36	11.208333	0.311343		

Wilcoxon Scores (Rank Sums) for Variable KEYEM
Classified by Variable GROUP

GROUP	N	Sum of Scores	Expected Under H0	Std Dev Under H0	Mean Score
Staff	6	130.50	117.0	24.595736	21.750000
Industry	32	610.50	624.0	24.595736	19.078125

Average scores were used for ties.

Wilcoxon Two-Sample Test

Statistic 130.5000

Normal Approximation

Z 0.5285

One-Sided Pr > Z 0.2986

Two-Sided Pr > |Z| 0.5971

t Approximation

One-Sided Pr > Z 0.3001

Two-Sided Pr > |Z| 0.6003

Z includes a continuity correction of 0.5.

Kruskal-Wallis Test

Chi-Square 0.3013

DF 1

Pr > Chi-Square 0.5831

Analysis of Variance for Variable KNOWM
Classified by Variable GROUP

GROUP	N	Mean
Staff	6	2.722222
Industry	32	2.989583

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Among	1	0.361172	0.361172	0.7535	0.3911
Within	36	17.255787	0.479327		

Wilcoxon Scores (Rank Sums) for Variable KNOWM
Classified by Variable GROUP

GROUP	N	Sum of Scores	Expected Under H0	Std Dev Under H0	Mean Score
Staff	6	87.0	117.0	24.767252	14.50000
Industry	32	654.0	624.0	24.767252	20.43750

Average scores were used for ties.

Wilcoxon Two-Sample Test

Statistic	87.0000
Normal Approximation	
Z	-1.1911
One-Sided Pr < Z	0.1168
Two-Sided Pr > |Z|	0.2336
t Approximation	
One-Sided Pr < Z	0.1206
Two-Sided Pr > |Z|	0.2412

Z includes a continuity correction of 0.5.

Kruskal-Wallis Test

Chi-Square	1.4672
DF	1
Pr > Chi-Square	0.2258