University of KwaZulu-Natal

INFORMATION SYSTEMS PERFORMANCE:

A STUDY OF INDIVIDUAL AND GROUP SOCIAL COGNITIVE PREDICTORS.

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Supervisor: Mr. M. Marimuthu

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SUPERVISOR'S PERMISSION TO SUBMIT FOR EXAMINATION

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As the candidate's supervisor, I agree to the submission of this dissertation for examination.

The above student has satisfied the requirements of English language competency.

(Appendix G)

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Date: 31 January 2017

DECLARATION

I, ……….Dean Achmad ………………………………………declare that

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ABSTRACT

Over the past decades, Information and Communication Technologies (ICTs) have changed the way that businesses and individuals operate, live and learn. The Information Systems (ISs) that drive these technologies have transformed the business and education environment in which they are applied and have become the key to the success of the ICTs. The IS development process is essentially a social activity where people engage to accomplish the evolution of an IS artefact. Information System Development (ISD) projects are the approach by which business delivers IS solutions and are often regarded as a mammoth undertaking executed by a group of people who are hired for their effective skills and experience with the focus on performance. Industry has been experiencing problems in the delivery of successful information systems where the evidence of the existence of the problem areas is widespread; however, there is a scarcity of appropriate solutions. Theoretical and empirical research is deficient in the context of performance improvement and prediction for information systems development project work. With academia being the training ground for industry, this is the appropriate setting to work towards practical achievable solutions and to later apply these to real-world situations for success. Hence the overall aim of this study is to investigate how to enhance student performance on both the individual and a group level from a social cognitive perspective and to derive knowledge and to develop tools and techniques to assist IS educators to better prepare graduates for the field with the necessary interaction characteristics and skills for success. This quantitative study intends to gather primary data and to interpret the findings using social cognitive predictor factors to improve student performance. The participants of this study, students (n = 140) were self-assigned to groups (n=26) on two campuses for an IS project-based course, who voluntarily completed a questionnaire. The responses were self-reported perceptions of their efficacy, individual group behaviour and observations of peer behaviour during group interactions. The nature of the problem and the supporting literature has made it necessary for the construction of a framework that incorporates the foundations of individual and group efficacy and group behaviour theories. The study revealed that IS Efficacy theory constructs do not strongly predict SD performance but do contribute valuable knowledge towards effective solutions for academia and the field.

KEYWORDS

Individual efficacy, Group efficacy, Group behaviour, Social cognitive theory, Information systems performance.

CATEGORIES

Social and professional topics: Information systems education.

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TERMS AND ABBREVIATIONS

α	Cronbach's Alpha co-efficient
IS	Information Systems
IS&T	Information Systems and Technology (also known as IS).
SCT	Social Cognitive Theory.
ISD	Information Systems Development.
IT	Information Technology.
ISP	Information Systems Performance.
K-S test	Kolmogorov-Smirnov test.
p	Probability.
r^2	Spearman's correlation co-efficient.
SGR	Small Group Research.
WWW	World Wide Web.
H_0	Null Hypothesis.
H_n	A stated hypothesis for the study. N being a range 1 to (n) a number based on the number of hypothesis.
IS-SaGE	Information Systems Self-Efficacy and Group Efficacy Questionnaire.
rho	Spearman's correlation of co-efficient, also known as rho.
UKZN	The University of KwaZulu-Natal, KwaZulu-Natal, South Africa.
Sr	Structured response
Sd	Semantic differential.

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CHAPTER 1: INTRODUCTION TO THE STUDY

1.1 Introduction

Information Systems (IS) have the function of storing and converting the data needs for the organisation to provide information. It is therefore given that an organisation should expend its best efforts on the "construction" or development of ISs with no compromise (Cecez-Kecmanovic, Kautz, & Abrahall, 2014). The building of an IS, is a proposed solution to meet the demands imposed on the organisation, to promote the organisation's opportunities for the success and to support its core business processes. The strategic value of such an asset cannot be underestimated (Love et al., 2007) with ISD projects being the vehicle for delivering the IS (Millman, 2007). With data being a significant organisational information asset, (Love et al., 2007) stresses the importance of deriving value using an integrated approach where people, processes and technologies are included. This research focusses particularly on the performance of ISD people, who according to Haider, Aamir, Hamid, and Hashim (2015) are the source of expertise, skills, knowledge and experience within an organisation. The human capital component of the organisational performance model is the most critical to the success of the organisation (Haider et al., 2015).

According to Hsu, Hung, Shih, and Hsu (2016), ISD projects are particularly multifaceted, demanding and require such skills as the ability to elicit knowledge from business processes and from the stakeholders of the project; the ability to pay attention to detail, the ability to convert this knowledge into requirements, the ability to apply quality and governance control standards and procedures and to deliver a system that will meet the intended requirements. Although the choice of the most appropriate technology, the design methodology, and the software platform cannot be understated they are not the primary consideration for this study. Rather, attention is focussed on the notion that possessing knowledge and skills about how to build a successful and effective IS will derive considerable value. Efforts to understand the characteristics that an employee (the human being) should possess to contribute to organisational success of ISD projects are fundamental to this research.

1.2 Background to the Study

Modern business organisation's face very challenging and competitive operational environments (Bilal & Awais, 2012) where they need to remain effective in order to remain viable and to succeed. Competition is a key external driver of business strategy and decision making. In this digital age of electronic business and commerce increasingly innovative ways of transacting are required to keep ahead thereby placing tremendous pressure on organisations to evolve how they do work and provide services (Cecez-Kecmanovic et al., 2014; Purvis et al., 2016). Hemmatfar, Salehi, and Bayat (2010)

had recommended that making the most effective decision is based on information about an organisation's operations.

Pertinent is the role of academic research and its significance to the real world (Lang, 2003) of ISD projects. The essential and much needed feedback to be gained and the outcomes to be derived from applying social cognitive and group behaviour methods is expected to provide knowledge about the influence of efficacy on performance. The problem of improving ISD Efficacy is expected to then go some way to its resolution with an end-product of producing knowledge about teaching and course design. Effective learning, graduate preparation, and student retention could be impacted for overall student success. Lang (2003) asserted that the small, but considerable, contributions in academic research which might not be immediately relevant for ISD practitioners to directly and practically implement but could be essential building blocks for future business solutions. Knowledge management is the deliberate and systematic coordination of an organisation's people, technology, processes, and organisational structure in order to add value through reuse and innovation. This is achieved through the promotion of creating, sharing, and applying knowledge as well as through the feeding of valuable lessons learned and best practices into corporate memory in order to foster continued organisational learning (Dalkir, 2011). By applying knowledge building and knowledge management this could be incrementally producing practical academic solutions that add value for ISD practitioners increases opportunities for effective relationships.

The construction of knowledge on how to improve the effectiveness of social cognitive processes in IS development projects would be a valuable contribution to academia as well as to IS field projects, yet there has been no identified panacea for success. Bandura's idea about individual confidence and its impact on striving for performance success is central to understanding IS individual performance. The Social Cognitive Theory (SCT) provides an efficacy factor that represents a potentially strong determinant of performance, which can be obtained from measuring self-reported perceptions of ability and interest factors of the respondents (Bandura 1989b). The importance of understanding ISD project learning and the variables that influence individual performance are expected to produce tangible and practical artefacts that can be used to produce reliable and predictable results. A meta-analysis by Cherian and Jacob (2013) has revealed that there is a scarcity of knowledge about the practical application of efficacy theory on performance in the workplace. Similarly, there is limited research on self-efficacy in ISD projects.

It is expected that an effective team should be able to deliver an effective IS solution (Sawyer, 2004). However, research into ISD project accomplishments indicates that there is limited success in this area and the current question is what is hindering the development of an effective IS. Frese and Sauter (2003), reported on various factors that could lead to project failure or the delivery of a IS that is not effective in terms of the original requirements. Their findings indicated that the major issue is that the

complexity of ISD field projects which accounts for the variation, and inaccuracies, in project planning, the variation in project decisions and the dearth of precise causes of failure (Cecez-Kecmanovic et al., 2014; Crawford, 2011; Dodson, Sterling, & Bennett, 2012; Goldfinch, 2007; Nauman, Aziz, & Ishaq, 2005).

However, Frese and Sauter (2003) have identified people factors as an area of concern in delivering the expected solution. To avoid the negative influence of the task complexity, (Frese & Sauter, 2003) suggested that managers should put interventions in place where the employee, in this case the ISD professional, is "prepared" and supported in terms of both the physiological and psychological aspects of the task and environment. This can be accomplished through education, training and the fostering of a supportive environment. Blumberg, Kent, Hare, and Davies (2012) purported that the influence of people's 'perceptions and thoughts' significantly impacts the variation in their interactions and behaviour. Therefore, from an academic standpoint, educating students with more effective skills, as supported by Vora & Markóczy (2012), is vital for success.

Situations where a student could have the capacity to function as an individual or as part of a the group in an ISD project would be an critical characteristic to guide teaching strategies to aid student learning and ISD field practitioners alike (Lang, 2003). It has emerged from various theories (Hardin, Fuller, & Valacich, 2006; Lam & Schaubroeck, 2009; Seijts, Latham, & Whyte, 2000; Whiteoak, Chalip, & Hort, 2004) that individual and group processes are important in understanding IS efficacy and could have an influence on IS performance. This indicates that behavioural factors could have a major influence on the outcomes of ISD. This is already common knowledge that this is a task for a group of effective and skilled people working together with a focus on performance and success (Ajala, 2013; Bahli & Buyukkurt, 2005; Guinan, Cooprider, & Faraj, 1998; Liu, Chen, & Tao, 2015; Vora & Markóczy, 2012).

Compeau and Higgins (1995) defined computer self-efficacy as "an individual's perceptions of his or her ability to use a computer in the accomplishment of a task, rather than reflecting simple component skill." Lopez and Manson (1997), had extended this research show the utility value of using the desktop IS and found that social pressure was an important variable (environmental) in the relationship of computer self-efficacy to the perceived usefulness of the computer for business purposes. Their study focussed on understanding the application of computer information systems to solve real-world business problems and the related impact on the organisations. At the time that their research was conducted organisations were making considerable investment in information technology and information systems. They also found that individual's beliefs about their ability to make use of computers were of great influence. There are many other studies (Doyle, Stamouli, & Huggard, 2005; Hauser, Paul, & Bradley, 2012; Lopez & Manson, 1997) that have applied computer self-efficacy to understand various variables in areas identified as problem domains. These variables include computer self-efficacy in

understanding the face-to-face versus online mediums and the perceived usefulness of empowered desktop ISs.

Few studies have investigated computer self-efficacy (Hauser et al., 2012), however, none have investigated self-efficacy as an additional explanatory variable of an individual's role in developing Information System (IS)/Information Technology (IT). Several studies also found significant relationship between self-efficacy and performance behaviour (Compeau, Higgins, & Huff, 1999). Very little of this research has been conducted in information systems development (ISD) where sufficient knowledge still needs to be gathered about the problem domain relating to project failure (Coffee & Rees, 2011; Frese & Sauter, 2003; Goldfinch, 2007; Salamah, 2014). An exploration of these behavioural factors that lead to IS performance success will encompass the analysis of what drives individual and the group efforts to achieve success. Such studies incorporating efficacy on both levels and behavioural factors are commonly conducted in efficacy theory research and small group research and could provide valuable insights into solutions for the ISD field. A brief discussion concerning the academic context of the study, the importance of a predictors of performance in ISD, the motivation and the benefactors of the study, the contribution and the focus of the study and the statement of the problem will follow.

1.3 Motivation for the Study

The major motivating factor and focus of this study, was the contribution towards understanding and applying individual and group student efficacy. This was expected to contribute towards the improvement of the individual's capacity to participate in project group work allowing work tasks to be performed in a more effective manner. Also, to assist in the process of determining methods and techniques to enhance ISD projects. These are areas that were identified by and needing attention particularly as organisations rely more on teams and groups to solve problems and to synthesize knowledge (Kim & Shin, 2015; Salamah, 2014; Vora & Markóczy, 2012). Important characteristics and skills like project management, performance success and accountability are vital for each student to develop, hence, if more knowledge can be gained then these areas can be potentially enhanced (Purvis et al., 2016).

Studying the efficacy dynamics of IS students to gain insights into what motivates them and what sustains their desire to succeed may contribute to the body of knowledge on ISD project performance. The likelihood of discovering important processes and procedures, which could be used in providing guidance on ISD with social cognitive awareness in mind, will be a worthwhile outcome. This knowledge could reinforce the role of IS academia in imparting real world IS solutions to remain

pertinent as suggested by Lang (2003). Hence, the response has been to conduct research to establish student self-efficacy factors in ISD. According to the investigation by Ajala (2013), Self-efficacy (SE) has predictive capability and can be developed to amplify performance in the area of training and wellbeing of people.

Nevertheless, the methods for development differ from the past, the idea of concentrating on the team concept as a possible IS solution still prevails. Current IS literature on ways of improving team effectiveness are abound (Eccles, Smith, Van Belle, & Van der Watt, 2010; Hardin et al., 2006; Kyprianidou, Demetriadis, Tsiatsos, & Pombortsis, 2011; Ogungbamila, Ogungbamila, & Agboola Adetula, 2010; Tasa, Taggar, & Seijts, 2007; Yang, Huang, & Wu, 2011). The academic institution must identify many areas of opportunity as possible for assisting in teaching and learning. Many studies have gone some way to find other strong predictors of academic performance which are non-cognitive (Schmitt et al., 2009) . 'If one is to maximize student performance on these outcomes, non-cognitive measures are likely to be more valid than ability' (Schmitt et al., 2009, p. 1481). Support for non-cognitive factors as much as cognitive factors would be useful for increasing students' chance of success in a course (Schmitt et al., 2009).

1.4 Who will benefit from this Study

This study sought to provide empirical insights into the factors that can be used to predict IS performance among third year IS students. New knowledge produced about performance prediction could provide significant ideas and techniques for more effective individual and group efficacy. As well to provide better insights to group composition, course planning and design in the areas of teaching and learning of IS student. This study may provide a view to making recommendations to educators and course designers for improving opportunities to facilitate appropriate learning strategies to build the educational and skill base for graduates. In addition, it may provide information about the needs of IS learners and recruiters in the business and IS field. Finally, it also may provide the waypoints to lead to the very institution (s) producing the graduates of the required calibre.

1.5 Contribution of this Study

This study is significant because it presents insights about individual and group factors of IS for predicting information system academic performance in South Africa for which there is currently little published knowledge about IS student group performance in African countries. Furthermore, this study highlights a relatively unexplored research context, namely IS efficacy which is a non-ability factors and behaviour factors indicated for improving and predicting ISP in IS courses and universities in general. This research is expected to advance the investigation and discovery of individual and group

behaviour factors which could impact ISD performance and to contribute to the creation of a set of tools and techniques that can aid IS practitioners. These artefacts would be expected to be used in identifying areas of concern and to be able to proactively solve ISD project problems prior to their occurrence. In support of this endeavour, the fact that in a current study, Bose (2012) highlighted that many problems still exists in the IS field today where people lack the skills to work competently in a team. An opportunity exists to contribute to improvements in the methods and techniques of education and training IS people both at the level of academia and that of field interventions.

The contribution of this research lies in the possible relevance of this research to a university in a South African context. International IS departments already experience much difficulty in producing successful graduates (Joshi & Kuhn, 2011). South Africa faces relatively the same issues; however, the situation is further compounded by a set of barriers for students (van der Berg, Taylor, Gustafsson, Spaull, & Armstrong, 2011). These include an unequal quality of education, unequal access to jobs and gender bias which together represent a stumbling block to successful performance. The role of higher educational institutions, in particular the IS departments, is to apply considerable effort to bridge the gap from ill-prepared and untrained entrant to the university to a skilled and successful graduate.

1.6 Focus of the Study

This study reviewed literature about the factors to predict ISP. The study investigated various enabling factors as identified in the literature, to ascertain whether they predicted IS performance in a third-year information system course, located at the University of KwaZulu-Natal, in the School of Management, Information Technology and Governance. The focus is on factors that are required for the entire ISD project where social cognitive and behavioural factors are relevant for individual and group IS performance.

The purpose of this study was to demonstrate the effectiveness of self-efficacy, group-efficacy and group behaviour as predictors of ISP. The study of these social cognitive and behavioural factors is expected to contribute towards the development of a model for the assessment behavioural factors on ISP. This may have implications for IS course design encompassing strategies for improving and maintaining ISP.

1.7 Aim of the study

Tinto (2006) had raised the concern of low student retention at the higher education level and the fact that this is a result of many different factors. In particular, low and mediocre student performance in IS, is a large and complex area where this study will attempt to triangulate on particular areas of improvement. The focus of this study is specifically on the factors of individual efficacy, group efficacy,

group behaviour and group identity; and the roles they play in predicting Information Systems Performance (ISP).

1.8 Problem Statement

Ellis and Levy (2009) purported that a clearly defined research problem provides the precise reasoning and motivation behind pursuing a study. IS student performance has been consistently mediocre over the past sixteen years since the year 2000, with the new millennium, not showing any significant improvements from the past. Student, and IS field, projects alike are failing to meet the objectives of a functional information system and the original specifications of the proposed design of the information system. Anecdotal evidence gained from the author's experience of lecturing students in such group suggests that there are very little organisational characteristics in the processes that groups follow, that there is a tremendous lack of group interaction behaviour skills and there is chaos in group interaction and communication when delivering group-work tasks (Paquin, Miles, & Kivlighan, 2010). Student performance is the dependent variable in this study and is lacking a strong independent variable as a predicator. In addition, no real tools and techniques exist to assist students on the individual and the group level to cope with group-work task approaches.

The independent variables in this study are individual efficacy, group behaviour and group efficacy are of interest in this study for evaluating their impact on the dependent variable to assist in IS performance. In this context, promotion to the next level in the following semester of study, Information Systems 32B, is obtained by achieving a final mark of 50 percent. Although 50 percent is a promotion criterion, Academia expects and encourages students to attain a much higher achievement in the range of 75 percent and higher, that is, a first class pass. It would be an ideal situation for the class average to be anything above 65 percent; however, the trend has been an average of between 55 percent and 65 percent, nothing close enough to 75 percent. These data utilised to produce the 55 to 65 percentage range has been extracted from the course mark sheets of three year prior to this study. This indicates the essence of the problem, as there is a tendency towards mediocre performance in ISD project learning.

1.9 Structure of dissertation chapters

Chapter 1: Introduction to the Study

This chapter introduces this study and its objective is explained. It reveals the research problem, research objectives and questions. The contribution of the study is explained and finally it maps out the structure of the study.

Chapter 2: Literature Review

This chapter elaborates on the research problem, discusses the concept of the information system, its impact on the business environment and other applications of self-efficacy. Furthermore, it elaborates on the problem area of IS failure and the need for gathering knowledge on how to understand the problem that can lead to possible solutions. It discusses a proposed model of IS self-efficacy from the individual and the group perspective encompassing behaviour and efficacy factors. The chapter also reveals the factors that impact ISD as determined by literature.

Chapter 3: Research Methodology

This chapter explains the proposed research model guiding this study, research objectives and research questions. The research design and methodology have also been discussed. Validity and reliability issues have been taken into consideration and ethical issues followed in this study as well as analysis techniques used are discussed.

Chapter 4: Analysis of Results

This chapter presents and discuss results.

Chapter 5: Findings and Recommendations

This chapter discusses the findings from collected data and makes recommendations. Limitations in this study and gaps for further investigation are identified and finally, conclusions are drawn.

1.10 Summary of Chapter One

As modern IS practice requires strong skills in both individual work and group-work tasks to solve problems more effectively and efficiently and constantly seek opportunities of improvement in process of group-work (Eccles et al., 2010). The appropriate role then for IS higher education, is then, to bridge the ICT skills gap between university students entering the system to produce competent graduates for the field. This thesis tries to elaborate on how answers to questions or knowledge gained from the study can lead to improvements in the education processes if IS development projects and those of IS field projects. The thesis is structured as follows; the literature describing the factors that are important to the study are reviewed, the research questions, aim and objectives are proposed, the related hypotheses will be derived during the review of the relevant literature, the research methodology and research design are then detailed, while the data analysis section presents the results. The implications section (discussion) then consolidates the implications as indicated by the findings pertaining to the factors of the study. The thesis is then concluded by summarising the findings and providing recommendations, including those for further study.

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

Preparing IS graduates for the field with the necessary characteristic skills is the passion of the IS educator. Individual and group factors are assessed for their relationship to IS student performance (ISP) both on the individual and the group level. Such a profusion of skilled personnel into the IT labour market can be expected to reduce the backlog and demand for IS development (James et al., 1999). In this regard, academics worldwide are experimenting with methods to enhance learning and learning strategies to increase student academic performance (Joshi & Kuhn, 2011). The prevailing literature has described possible predictors of ISP (Coffee & Rees, 2011; Doyle et al., 2005; Hardin et al., 2006; Hauser et al., 2012; Mills, Pajares, & Herron, 2007; Seijts et al., 2000). It provides the philosophical foundations for research methodologies designed for action and intervention (Breu & Peppard, 2001). ISD (Hsu et al., 2016) is a process that is complex, time-consuming and one which has a shortage of the human resources to effectively manage large and critical projects (Guinan et al., 1998; McMurtrey, Downey, Zeltmann, & Friedman, 2008). Despite constant advances in tools and techniques for ISD, the practice lacks the understanding of the particular human factors of individual and group characteristics which lead could to information's systems performance improvements. Vongsavanh and Campell (2008) found that a lack of particular characteristics impacts an individual's ability to interact and communicate. Eccles et al. (2010) found that group skills are crucial prerequisite requirements to be able to accomplish the work of IS development.

2.2 Information System Concepts

A suitable definition of information systems has long been outstanding; academia is often behind practitioners in all respects. However, Zwass (2017) refers to an IS as an "integrated set of components for collecting, storing, and processing data and for delivering information, knowledge, and digital products". Further he states that organisations, governments and individuals rely on IS to conduct various activities and operations which are more effective and cost-effective than manual, in person, approaches. This is for the purpose of interacting with customers, suppliers, citizens and peers for online sales and services, for socializing, study, shopping, banking, and entertainment. Goldfinch (2007) provided a broad definition of an information system (IS) as a computer system combined with the organisation and personnel to produce useful outcomes. Guinan et al. (1998, p. 105) provided a suitable but incomplete definition for IS, "as an activity intended to produce a product that will affect one or more stakeholders".

2.2.1 Business Information Systems

O'Brien (2005) purported that it imperative that there is a specific understanding of how ISs impact the business function and how ISs are they are grouped into business function categories. Also, the variety of ISs that exist to support both small and large businesses in the functional areas of product development, production, distribution, order management, customer support amongst others areas. Internationally businesses use Internet-based technologies to integrate the flow of information among their internal functions and external stakeholders (O'Brien, 2005). ISs are also used as tools to support new approaches to performing management areas of marketing, accounting, HR and finance where much of the work tasks are integrated and automated as opposed to being separate in the past.

2.2.2 The stakeholders of Information Systems

Stakeholders are non- team members that influence design activities and are impacted by the resulting IS (Guinan et al., 1998). These stakeholders assess performance based on their knowledge of the organisational needs, experience with previous and ongoing system design projects, and their expectation of quality work. In addition, team members have a constant stream of information about team interaction and can use that to evaluate performance. Stakeholders are more distant and frequently rely on specific quantitative data such as meeting budget and schedule commitments. We therefore conceptualize performance in two different ways: the team members' ratings of their own performance (Kim & Shin, 2015) and the stakeholders' evaluation of it (Guiller, Durndell, & Ross, 2008).

Various studies have identified group process theories for IS that focus on the basic premise of these where performance is a result of the interactions and dynamics among team members (Bahli & Buyukkurt, 2005; Bergami & Bagozzi, 2000; Blumberg et al., 2012; Bushe & Coetzer, 2007); Guinan et al. (1998, p. 101); (Hardin et al., 2006; Klocke, 2007; Kyprianidou et al., 2011; Lam & Schaubroeck, 2009; McLeod & Poole, 2010; Ogungbamila et al., 2010; Reynolds, 2011),. It was identified that behaviourists maintain that people, skills, and team characteristics most determine success (Ancona & Caldwell, 1992; Hummel, Rosenkranz, & Holten, 2015; Liu et al., 2015; McGrath, 1984; Sproull & Kiesler, 1991) and the second-level (social/relationship) effects (Sproull & Kiesler, 1991). A well-functioning IS should produce reliable and timely information, be capable of analysing this information to guide activities across all, enable decision-makers at all levels of the system to identify progress, problems, and needs; make evidence-based decisions on and optimally allocate scarce resources. All of which are key elements in the success of large-scale efforts to achieve improvements (Mutale et al., 2013).

2.2.3 The phases of an Information System

ISs are defined by the phases of requirements gathering, systems analysis, systems design, coding and development, on-going maintenance; amongst others (Topi et al., 2010). The purpose of which is to guide the development of the IS being built. The phases represent the stages by which the system is evolved from mere discussion and narrative to a final functional software artefact together with the documentation representing the knowledge of what the system does and how it works. Each phase represents a refinement of the requirements for the proposed system while transferring the business knowledge from people and the previous system to build a new system. Requirements gathering are concerned with gathering information about the functionality of the future proposed system (McMurtrey et al., 2008; O'Brien, 2005; Topi et al., 2010).

2.2.4 Student Information Systems Field Readiness

Preparing IS graduates for the field with the necessary characteristic skills is the passion of the IS educator where the contribution to the quantity and the quality of available skilled IS workers is extremely valuable and fulfilling. Such a profusion of skilled personnel into the IT labour market can be expected to reduce the backlog and demand for ISD (James et al., 1999).

In this regard, the motivation factor for academics worldwide has been to enhance learning and learning strategies in order to increase student academic group performance, particularly in IS (Joshi & Kuhn, 2011) student group projects. Highly effective, productive and enthusiastic (motivated) student group behaviour will present a positive impact on the graduate's readiness for the workplace. Possessing these behavioural characteristics while studying should impact academic performance.

2.2.5 The role of the academic community in IS research

The role is one of a position where the method of social inquiry is designed to explore ways to accomplish tasks, ways to build knowledge and ways to discover from participation. Here the researcher's role in and impact on the research process and outcomes is important where the researcher changes the system and the people that are researched (Breu & Peppard, 2001).The most important characteristics of the research is the obtrusiveness of the research into the world of the research subjects. Much academic research has been conducted to assist the learning in higher education (Brown, Tramayne, Hoxha, Telander, Fan, and Lent, 2008; Çubukçu, 2012; El-Gayar & Moran, 2006). However, not enough has been conducted in IS development performance

The research approach, however, seeks to know much about the subjects by prying, probing, being intrusive, etc. Decades ago, IS research by Benbasat, Goldstein, and Mead (1987) reported that IS researchers have been relying on practitioners to produce knowledge and to provide direction in the field. There has however, been some real direction about student performance (Bopape, 2009). On a global context, higher education academic IS departments of the universities are experiencing difficulties in the IS courses with student performance (Bergin & Reilly, 2006; Lynch, Hienze, & Scott, 2007). Bergin and Reilly (2006) in a Computer Science course investigated a predictor of performance and found that poor performance may impact negatively on the role of the department to produce graduates to meet industry requirements as organisation rely on the educational institutions to produce the appropriately skilled entrants (Kola, 2015). Egwali and Igodan (2012) found that students have poor performance in ICT.

The focus of the literature reviewed here is expected to identify possible factors that could be used to predict IS performance for IS Education Departments, in the South African context, there is little data on IS performance. A number of researchers have recommended that multi-level efficacy factors are to be investigated with reference to the particular problems in IS performance (Andersen & Chen, 2002; Bahli & Buyukkurt, 2005; Brown et al., 2008; Hauser et al., 2012; Lu, Xiang, Wang, & Wang, 2011; Nelson & Cooprider, 1996; Pajares, 2003; Seijts et al., 2000).

Laurillard (2013, p. 23) suggests that the academic environment is a scientific model of the real-world and is not always a true reflection of the environment. It is one that is an "artificial" and scientific creation of reality that students still need to be taught to interpret. Here students have to understand how academia portrays the real-world and also to understand the workings and experience real world without physically participating in the world being portray. This may be important in the justification of group works projects where students engage to complete ISD work tasks which simulate real-world work tasks.

The academic community can also observe trends particularly those students that show interest in particular areas. For example in the study by Panova et al. (2016), they examine the trends in teacher-students interaction and found that interactive methods of cooperative learning are a positive trend. They found that students benefitted from the visualisation and modelling of field situations in their academic environment scenarios and that this process initiated self-directed learning. Such learning could boost student social and professional development thereby enabled a more prepared, field-ready and confident students. Any confidence building strategies would be beneficial to strengthening student efficacy (Van Der Roest, Kleiner, & Kleiner, 2011; Wan & Rucker, 2013).

2.2.6   Information Systems Performance as a factor of Student Success.

ISP is placed in perspective for this study, in Figure 1, and conceptualized to be a sub-problem of the larger problem of IS Student Success which is however, not the focus of this study. All problems of the academic IS domain can simply be conceptualised to be factors of the macro variable of Student Success. In order to understand Student Success at least the following micro variables of student retention (Tinto, 2006) which accounts for the ability and motivation of the student to persist with tertiary study; of career readiness (Sampson, McClain, Musch, & Reardon, 2013) which account for the understanding of the preparedness of the student for their future career; and, of the main interest in this study, the variable of ISP.

Figure 1: The Construct: Information System Student Success
(Gutierrez, 2014; Sampson et al., 2013; Tinto, 2006)

IS Student Success
- IS Student Retention
- IS Student Field Readiness
- IS Student Performance
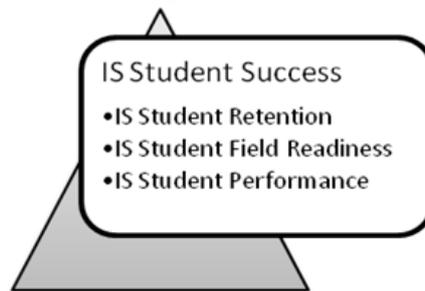
Gutierrez (2014) states that students need to be exposed to a situation where they are exposed to and discuss particular cases allows students to project themselves into the environment like the work place, while exploring difficult circumstances without fear. Thereby, the students are given cases that required problematic situations in practice. The students are introduced to cases / situations in which they consider the problem and expected to provide different alternatives. In ISD environments they are expected to provide a solution to an information system problem.

ISP is sub-problem of student success, however, it seems to be logically related to both of IS student retention and IS student readiness (Gutierrez, 2014; Purvis et al., 2016). It can be hypothesised that the former are possibly latent variables in the relationship of ISP to Student Success, as improvement in ISP are expected to enhance the latent variables thereby positively impacting student success. For the purposes of precision, only the factors that contribute to success in ISP should be explored. ISP is identified as a problem with the aim of informing insights into possible enhancements and strategy building initiatives.

At a macro level, that is, from a global perspective, various issues are identified as factors or sub-problems of the problem of student success. First, conceptualised at a micro level, Tinto (2006) highlighted a serious concern of low student retention at the higher education level, namely factor one. Nevertheless, the focus of that study on low income students, the observations were that efforts to improve retention should benefit all students. Although a global problem, IS not immune but rather plagued by student retention problems. As identified by Topi et al. (2010, p. 1), the interest in the study of IS as a field has dramatically declined among students at many institutions, hence, "it is imperative that the IS community as a whole addresses this problem from several different perspectives".

Second, also conceptualised at a micro level, student field readiness, identified by Mackrell (2009, p. 180) as a serious concern, namely factor two. Mackrell (2009, p. 180) postulated that because "the IS field is dynamic", "inevitably, changes in IS impact the education sector since graduates need to be employable". The investigation sought to determine the effectiveness of the course or programme in their study for student preparedness for the IS field (Mackrell, 2009).

Third, also conceptualised at a micro level, IS Performance (Gutierrez, 2014; Purvis et al., 2016), operationalized in this study to be ISP as such, a sub problem of student success, namely factor three, represents at least one more factor along the journey to a possible solution to student success failings. Should factor 3, the focus of this study, together with other factors of 1 and 2 be given attention in research studies many inroads could be made to gain knowledge for providing solutions for the IS student success dilemma (Ajala, 2013; Hackman, 2002b; Li, Jia, & Zhang, 2013; Stajkovic, Lee, & Nyberg, 2009; Vora & Markóczy, 2012).

From the perspective of ISP, an important insight revealed by Lotkowski, Robbins, and Noeth (2004, p. 13), is that despite a student possessing a strong academic ability, failing "to develop adequate academic self-confidence, academic goals, institutional commitment, and social support and involvement" can present performance risks. The consideration of non-academic factors is therefore vital for student performance improvement efforts, particularly for ISP. Current IS literature on ways of improving team effectiveness are abound (Eccles et al., 2010; Hardin et al., 2006; Kyprianidou et al., 2011; Ogungbamila et al., 2010; Tasa et al., 2007; Yang et al., 2011).

2.2.7 The importance of a predictor of IS student performance.

The view that performance success measured by ability is not the only means to measure and possibly predict performance is important (Schmitt et al., 2009). Northcote (2009) found that student emotion and social interaction are extremely influential in approaches to learning adopted by students (Brown

et al., 2008; El-Gayar & Moran, 2006; Nassuora, 2012; Tarhini, Hone, & Liu, 2013; Tinto, 2006; Weissberg & Owen, 2005). Further, Lotkowski et al. (2004) suggested that student attitude and behaviour are as important as ability in predicting and determining performance. By exploring behaviour this has led to the application of SCT, Social Cognitive Theory, as an appropriate grounding and as a means to measure the factors that lead to improved academic IS group project performance at the individual and group level (Bandura, 1989b; Brown et al., 2008; Tasa et al., 2007). While there are many studies (Bell, 2007; Bergin & Reilly, 2006; Blewett & Achmad, 2005; Brown et al., 2008; Bushe & Coetzer, 2007; Rohde & Thompson, 2007; Schmitt et al., 2009; Weissberg & Owen, 2005) which provide insights into factors for predicting performance, there is little knowledge available about predicting ISP in a South African context.

Predicting IS academic performance of students pursuing an IS project-based course in the context of the University of KwaZulu-Natal in South Africa is relevant. The study provides evidence of factors that are expected to influence student performance on both the individual and on a group level. Multi-level efficacy measures, together with group behaviours are hypothesised to positively influence ISP. It is important to elaborate on the phenomenon that gives rise to enhanced performance, particularly the social cognitive (Bandura, 1989b) and non-cognitive (non-ability) factors (Schmitt et al., 2009). According to Bandura (1989b), the idea that 'cognitively generated motivation can motivate and guide people's actions anticipatorily through the exercise of forethought' is pertinent to this academic research study, particularly the exploration of the individual's ability to regulate behaviour. Of particular relevance to the South African context, Schmitt et al. (2009) argues that a balance of cognitive and non-cognitive techniques could contribute to increases in variety in the student population which is a welcomed advantage for such a context. Schmitt et al. (2009) have identified non-cognitive, behavioural, factors which include the assessment of background, interests, and motivation. An investigation of the factors that may predict student academic performance is relevant and potentially beneficial for the improving the body of knowledge on ISD.

From the perspective of group performance, the extent to which a group has a sense of identity is a key determinant of success (Bergami & Bagozzi, 2000; Mael & Ashforth, 1992). This study also explores the concept of group identity or "belongingness" (Mael & Ashforth, 1992, p. 104) as this attribute contributes to stronger cooperation leading to success (Patel, Budhwar, & Varma, 2012). Mael and Ashforth (1995) argues that group members with a strong identity perceive themselves as "...psychologically intertwined in the group's fate, sharing its common destiny and experiencing its success ..." (Mael & Ashforth, 1995, p. 310).

Further for the group performance perspective, cooperation between same and different gender (sex) members (Balliet, Li, Macfarlan, & Van Vugt, 2011) is to be investigated to determine if it has an impact on cooperation, hence influencing group performance. Particularly in an effort to establish these variables in academia as predictors of student IS project group performance. IS educators have been striving to improve their approaches to produce graduates with appropriate skills for the job market (Vessey, Ramesh, & Glass, 2002). Improvements in the effectiveness of IS performance strategies are required. As Vessey et al. (2002) have recognized that industry practice mirrors education, hence IS educators should now apply industry identified strategies to leverage performance enhancements, particularly for academia.

Van Der Roest et al. (2011) had identified self-efficacy as a measure of confidence which is directly tied to motivation which managers apply in practice to their management strategies to leverage self-efficacy. Efficacy factors could be applied as predictors of IS performance to courses which could then drive improvement. Knowledge about group processes (Liu et al., 2015) are important in creating appropriate strategies for performance success. Exploring the facet of group-work for ways to improve project success (Shamir, Brainin, Zakay, & Popper, 2000), particularly to determine its relationship to ISP is vital. An exploration of group behaviours of the individual as well those identified by the individual to exist in other group members. These useful insights could assist IS educators in finding the factors that enable group success.

Blewett and Achmad (2005) had classified factors with predictor capacity into Pre-course and In-course predictor categories. The findings in their study suggest that there is merit in identifying students who need support early in the course. This has enabled the categorization of this study with a primary concern of factors that have this predictive capacity and that can be applied in the In-course Predictor category. It is expected that the results from this study will further reveal insights into how ISP achievements can be realised.

The literature review has thus far highlighted factors that may influence IS group performance and that should be investigated namely individual and group social cognitive predictors. This is could a great inspiration for an intervention to help the student when acting as an individual and / or when interacting in a group. Knowledge obtained about how to guide students on what to do on their own and when working in a group would be extremely valuable for any IS academic. A study that focuses on gaining insights into ISP is crucial, particularly in relation to making improvements for group teaching strategies and interventions to aid learning for the individual as well as for the group (Ogungbamila et al., 2010).

In a South African study of IS industry practitioners, in the recent past, Eccles et al. (2010), show that groups of effective people, i.e. teams, are still perceived as the means to conduct ISD project work.

IS academia plays a role in meeting the demands of the IS industry by providing competent students to match these required roles (Mackrell, 2009). Vessey et al. (2002) reported that IS industry practice relies on the IS academia to educate labour market entrants, the human resources for the IS field. Enhancements to IS study programmes would simply be expected to contribute to producing more effective and successful graduates. It is not that students are experiencing failure, but rather that they are not experiencing performance excellence. Knowledge needs to be gained in IS student project performance on the individual and group level and possibly the determination of predictors of performance.

Further, in an effort to examine the social interaction situation (Balliet et al., 2011) for the exact nature or foundation of the strength of such behavioural indications this study has applied small group theory (SGT) to measure the interactions and social behaviour of the various groups of interest in this study (Ogungbamila et al., 2010; Paquin et al., 2010; Reynolds, 2011; van der Kleij, J., Werkhoven, & De Dreu, 2009; Whiteoak et al., 2004).

Reynolds (2011) argued for the effectiveness of using behavioural data to understand group process, however, should the investigation be strengthened by the application of social identity processes this would provide valuable insights. Only once the social identity processes are added, should the behavioural observations of the study be considered informative. The effects of group identity where the group is viewed as a psychological group on shaping behaviour warrants further investigation. A valid assessment of psychological processes concerning the group and group behaviour is required (Reynolds, 2011). Findings in the literature suggest that individual group behaviour and peer group behaviour impact group interaction behaviour thereby significantly impacting the learning and teaching strategy (Tasa et al., 2007).

Blumberg et al. (2012) had stated that the influence of people's 'perceptions and thoughts' significantly impact their variation of interaction and behaviour. Bandura's idea about an individual's confidence and its impact on striving for performance success is important for the study of ISP and would be useful in understanding IS individually, as well as, group performance. The Social Cognitive Theory (SCT) provides an efficacy factor that represents a strong determinant of performance which can be obtained from measuring self-reported perceptions of ability and interest factors. Therefore, educating students with more effective skills, as supported by Vora & Markóczy (2012), is vital for success. Through understanding of IS project learning and the variables that influence ISP it is expected to produce the very tangible and practical artefacts needed to produce reliable and predictable results. The construction of knowledge on how to improve the effectiveness of social cognitive processes in IS development

projects would be a valuable contribution to academia as well as to IS field projects. The possibly of identifying a predictor of academic performance from the variables of group efficacy and behaviour would be a significant contribution to the body of knowledge.

Originally, Bandura (1977, p. 212), promoted Self-Efficacy as a theory however, it has been used as a factor in many studies to predict performance. According to the study findings people put more effort into understanding the diverse sources of information they have access to and then regulate their choice behaviour and effort expenditure accordingly. Bandura (1989b, p. 733), strengthened the factor by adding new insights from a newer study, suggesting that the higher perceived self-efficacy relates to higher performance attainments. This certainly has implications for IS group performance. Self-Efficacy is strongly supported as a predictive factor in performance in others studies (Doyle et al., 2005; Lalbahadur, 2008; Seijts et al., 2000; Tømte & Hatlevik, 2011; van Dolen, de Ruyter, & Carman, 2006; Whiteoak et al., 2004), is still strongly purported.

2.3 The field of Information Systems Development

Hsu et al. (2016) have defined ISD work as the fashioning of an artefact to support organisational processes. Here, the system being built should be able to provide information, communication and processing support for users of the organisation which is based on a set of requirements for solving a particular problem. According to (Hsu et al., 2016), such a project team is composed of individuals from technical, managerial, and operational backgrounds. Team members with different skills and expertise frequently have limited experience of working together. ISD teams have the challenge of effectively coordinating the expertise of multiple stakeholders (Hsu et al., 2016). One of the first tasks before any project work begins is to coordinate the talents, skills and knowledge required to enhance the team performance. Hsu et al. (2016), suggest that this is a critical success factor for ISD projects. They found that effective coordination behaviour is an important antecedent to the success if ISD projects. The daily activities of the team have to be coordinated to achieve short term and long term goals of the team. The coordination should effective for the subdivision of goals into actions, assigning actions to actors, resource allocation among actors and information sharing (Hsu et al., 2016).

It has been long known where Vongsavanh & Campell (2008) had identified that the skill set required for business analysis work tasks in the IS field is specialised as well the tasks associated with developing an IS are complex. What further complicates the tasks of developing the IS the increased number of members of the ISD group (Sawyer, 2004) which typically consists of at least a team lead, a software developer (programmer), a business analyst, a project manager, a system operator and possibly a systems analyst. Research by Hunt, Rogers, and Bashaw (2000), highlights the complexity faced by organisations operating in a multi-national environment, typical of ISD projects. They particular highlighted that the intra and extra group communication still needs to go through different phases in

order to evolve in a mature 'low-noise' and which is a more reliable, stable and robust channel (Hunt et al., 2000). Hence, adding more resources does not make for an immediately more effective solution but requires a period of adjustment and maturity.

2.4 Complexity and failure in ISD projects

The complex nature of the business requirements that information systems (IS) are based on is what makes projects very complex constructions (Hartmann, Fischer, & Haymaker, 2009; Purvis et al., 2016). ISD is an epic undertaking and from a historical perspective it has experienced many problems (Guinan et al., 1998). Their field investigations revealed that the IS industry did not possess the ability to effectively manage large and critical projects. Quite importantly, their findings indicated that the skill and experience of the team, or group, is as important for effective team processes as are the software development tools and methods (Guinan et al., 1998; Vongsavanh & Campell, 2008). In order to understand IS success and failure of IS project, the "ätcors" will need to studied to gain insights into determine what factors lead to failure or success in IS Projects. Cecez-Kecmanovic et al. (2014), identified that ISD projects have experienced problems relating to at least the areas of the actor, the tasks, the project structure and the particular technology employed.

Purvis et al. (2016), found that ISD projects problems will continue as projects escalate in size, complexity, and function (Hummel et al., 2015). According to Bose (2012), it was highlighted that, broadly defined "soft skills" in IT are indeed still a problem, hence indicating that such IS problem exists and that they need to be resolved. This report on the practitioner's experiences, identified at least skill weaknesses in the effectiveness of team work, communication, relationship building and in presentation skills. The possible reasons for which were indicated as possible deficiencies at the education and training level. Nevertheless, the methods for development differ from the past, the idea of concentrating on the team concept as a possible IS solution still prevails (Lu et al., 2011; Ogungbamila et al., 2010).

The difficulty in delivering such a solution is as a result of the complex nature of ISD projects and is often a reason for failure (Cecez-Kecmanovic et al., 2014; Dodson et al., 2012; Goldfinch, 2007; Heeks, 2006; Nauman et al., 2005; Salamah, 2014). Frese and Sauter (2003) report that of the various factors that could lead to project failure or the delivery of an ineffective design, the weaknesses of the people on the project is a real issue. If this complexity is not managed effectively, the project is highly likely to fail (Crawford, 2011). Goldfinch (2007) has indicated that at least 20-30 percent of all ISD projects are failures, where the larger the project the greater the chance of failure. Also, that around 30 percent to 60 percent are partial failures. Here failure is identified by over runs in terms of time and cost as well as not meeting standards. Recently, Salamah (2014) found that many ICT projects experience difficulty and as such are classified as either challenged or impaired. The work-tasks of the project are complex,

time-consuming and require a highly defined skill set in order to elicit knowledge from existing business processes (Salamah, 2014). Many projects identified had a scarcity of skilled resource which created more difficulty. The available workers also are expected to prepare accurate requirements, to deliberate on possible solutions, to apply quality and governance control standards and procedures and to eventually to deliver the appropriate system (Bilal & Awais, 2012; Vongsavanh & Campell, 2008).

Nauman et al. (2005), suggest that even the learning from an ISD Project failure plays a key role in the long term success of any organisation ISD efforts. The continuous improvement via evaluation and monitoring of its failure causes adjustments to the way in which ISD projects are planned and executed. However, failure wastes resources, discourages further investment and the opportunity costs are certainly high and they impact first world versus developing countries differently (Nauman et al., 2005). Where there are a limited availability of resources such as capital and skilled manpower, the impact of failures can be very negative. However, there are more opportunities and lessons to be learned from failed IS projects than there are from the successful IS projects.

The application of project intervention strategies to rescue failing or failed projects has relatively good rates success. Crawford (2011) suggested that they are short-sighted and represent an approach that will first allow failure to occur and then put in place a recovery strategy. Such approaches are more reactive in nature, will occur after the fact and seem to consider failure as something that, if it occurs can be rectified. It is expected that the disciplines of ISD and Software Engineering would have matured to levels where such approaches are avoided. More research is needed to develop strategies that can assess and identify areas of concern or potential project failure as early enough as possible to steer projects in the right direction (Salamah, 2014). Strategies which are characterised by a more proactive approach focussing on the individual and the group level could guide and develop the human resource factors to lead IS to deliver success (Yang et al., 2011). Johnson, Johnson, & Smith (1998), purport that the value of people being open to continuous learning and that learning from mistakes for improvement is important. Johnson et al. (1998) also point to the fact that the members of a team or group should take all available opportunities to deliver the expected solution and improve as they go to produce a solution that incrementally improving and waiting for completion before failure is experienced (Cecez-Kecmanovic et al., 2014).

2.5 Factors that can have an influence on ISP

This study has sought to identify factors that can be used to strongly and accurately determine IS performance. Many factors have been identified as important contributors to performance; however, for various reasons as mentioned in their discussions below, they are not part of the major theoretical framework chosen for the study.

2.5.1 End User Efficacy and Career Intervention Models as IS Theories

The exploration of efficacy measures to predict or influence performance for IS and IT is not an entirely new occurrence as it has been applied to measure end-user self-efficacy (Compeau et al., 1999; Doyle et al., 2005; Hauser et al., 2012; Shu, Tu, & Wang, 2011). Compeau et al. (1999) argued that 'IS research has demonstrated a strong link between self-efficacy and individual reactions to computing technology, both in terms of adoption and use of computers' (p.2).

Joshi and Kuhn (2011), have applied the Theory of Reasoned Action (TRA) to measure student's intentions to pursue a career in IS, but particularly as a career choice model, that is, to determine the factors that create interest in an IS career. The theory proposed by Compeau et al. (1999) is applied to measure the attitudes of end-users to computers in general and not specifically to an ISD team or group. An efficacy theory should be domain specific (Bandura, 2000) for which an efficacy theory for ISD performance would be appropriate to understand behaviours of such teams. Members of such teams would at least include the developers, analysts, project managers, team lead (s), amongst others (Liu et al., 2015; Purvis et al., 2016). An Efficacy theory, unlike one applicable for end-users only, should measure the interactions of IS producers with more in-depth, comprehensive and appropriate inquiry for its impact on information efficacy performance (Lu et al., 2011).

The theory by Joshi and Kuhn which although being more focused on information system producers is still too generic and is not focused on the problem of solving IS group interaction problems but in particular the reasoning being the particular career choice of IS (Joshi & Kuhn, 2011). Hence, this theory, nevertheless being complementary, is not particular to the problem at hand and is not sufficiently social cognitive in nature. In contrast, Social Cognitive Theory is expected to describe the factors that can lead to predicting performance and for identifying any factors for success in important for the field of ISD. Self-efficacy is, however, not directly related to theories about readiness for career interventions (Sampson et al., 2013).

2.5.2 Brain-based Studies of Team Effectiveness

Woolley et al. (2007, p. 97) proposed a contribution to team effectiveness by following an approach based on advances in Cognitive Neuroscience. Here two team members operate in a group as though systems of a brain would work; in order to explore insights in social interactions in groups. Their inspiration was that individuals differ in how well specific brain systems function and that such differences in brain function predict differences in performance. Their aim was to gain further insight into processes of group formation and task specific abilities. Specifically, they predicted that a team task that requires both spatial and object visualization would be better performed by a spatial visualizer working with an object visualizer. They hoped that the neural system which is the key then can work

together in the team itself. A situation where the matching of member abilities to roles and the matching of member abilities to tasks requirements would be an ideal goal (Woolley et al., 2007, p. 98). There are implications identified here for strategies forming of student groups as well as for matching tasks to group member abilities. However, useful these findings are, this study was not based on findings of social cognitive and behavioural factors and their relationship to IS performance. What is required is a deep-level composition variable to aid in predicting performance (Bell, 2007; Bushe & Coetzer, 2007; Coffee & Rees, 2011).

2.6 Individual Factors

The capability of the individual in delivering the expected solution is not to be under-valued as this factor is concerned with the study of its influence on performance from the point of view of the individual. In this case, trying to understand what characteristics about the individual can shed some light on improving their performance (Andersen & Chen, 2002; Bandura, 1977; Lalbahadur, 2008; Lopez & Manson, 1997; Mills et al., 2007; Van Der Roest et al., 2011). Bandura (1989b) posited that an individuals' performance can be manipulated and enhanced by "how they interpret and apply their abilities". According to him their Self-efficacy beliefs affect how effectively they organise and apply their capacities. This can possibly help to explain the phenomenon of why people with similar capabilities can deliver varying performances and quality of work.

2.6.1   The concept of the IS individual and individual theories

The importance of a study of ISP and its relationship to individual efficacy from the point-of-view of the person is important to the body of knowledge (Ajala, 2013; Cherian & Jacob, 2013). Assessing the efficacy of the individual could assist in determining that type of behaviours that the individual enacts to complete works tasks, this either the student or the IS field worker (Ajala, 2013; Cherian & Jacob, 2013; Van Der Roest et al., 2011). In such a process positive and success behaviour could be identified and negative or failure behaviours could be eliminated. A performance of the individual student or IS field worker at the end of the semester or performance period could be compared to this efficacy score to provide information about the performance of the individual to help guide the team lead or the academic. Investigations about the individual may be guided by Social Cognitive Theory.

2.6.2   The impact of individual efficacy on performance

Crawford (2011) claimed that a key cause of the failure to deliver the envisaged IS system as either the lack of resources, conflict among resources, turnover of key resources or the poor planning by the resources on a project. The ability of the organisation to access a group of professionals with the necessary skills and the capacity to build an effective information system will promote opportunities

for success. Nevertheless, sustaining an effective ISD team is often underestimated; with the consequential absence of the right IS workforce for the job will leave the organisation vulnerable.

2.7 Group Factors

Junge and Reese (2017), in their study of environmental action found that collective behaviour is an important factor in understanding group action. They used collective efficacy help understand how groups progress from simple pro-environmental behaviours to more difficult tasks. They found individual behaviour impacts group behaviour and that various social process enable individual to act as a unit or group (Gibson & Earley, 2007; Junge & Reese, 2017; Kim & Shin, 2015; Liu et al., 2015; Shamir et al., 2000; Stajkovic et al., 2009; Tasa et al., 2007). These factors are explored in this study in order to understand the influence on performance from the point of view of the individual in a group situation. ISD projects are built by a group of people and it is this group that need to coordinate their activities to deliver a successful project (Hsu et al., 2016). In this case, trying to understand what characteristics about the individual student functioning as a member of a group can shed some light on improving their performance (Lynch et al., 2007). The assessment of the combined or consolidated information and ideas gathered from the group is to be assessed to determine whether group as a composite unit is consistent in their thoughts and their operational tasks is important to determine the relationship to the consistency of the completed tasks. According to Tasa et al. (2007) group deliberation and interaction behaviour has significant impact on group performance (Black, Welser, Cosley, & DeGroot, 2011; Gastil, Black, & Moscovitz, 2008). Liu et al. (2015), hypothesise that the pooling of resources which combine skills, knowledge and information from individuals is important to manage the complexity of ISD projects.

2.7.1   IS Industry based teams

Ogungbamila et al. (2010), studied IS teams in industry and found that significant value was not placed on the size of the team but on the level of commitment indicated by their attitude. Teams possessing a positive attitude were significantly more committed. Prior research by Hackman (2002c, p. 233) found that "teams markedly outperform individuals" and that merely having a great leader is not sufficient for information system performance success. ISD project teams are the key to delivering projects of an information system nature (Hsu et al., 2016). Such teams are often across various disciplines, skills and knowledge areas and a key problem is there inexperience in working together in such a unique environment as an ISD project (Hsu et al., 2016; Li et al., 2013). Cecez-Kecmanovic et al. (2014), observed teams in the IS field to understand collective existence and what this construct meant to the team and how this impacted their performance as a group. The research involved the tracking and tracing of the unfolding relationships since the beginning of the ISD project.

Hummel et al. (2015) found that IS industry teams often follow methods of Agile ISD to address the dynamic and complex environments to help management change. They found that both direct and indirect communication approaches have an impact on both the collaborative methods that teams employ and the success and failure of the team. They found that traditional ISD method-based team follow an indirect method of communication whereas the agile based team follow a more direct communication approach. This study does not focus traditional versus agile approaches but just the behavioural factors of the group.

2.7.2 The concept of the group and group theories

Much research on small groups has been conducted (Black et al., 2011; Blumberg et al., 2012; Bushe & Coetzer, 2007; Kyprianidou et al., 2011; Li et al., 2013; Paquin et al., 2010; Vora & Markóczy, 2012). Sawyer (2004) had identified the concept of the group to collectively refer to an gathering of individuals, students in this case, organised together as a team or group, with the requirement of the production of an information system using a development project mechanism, as part of a course or a real-world IS project. The application of the concepts of the salient group and team being used interchangeably within the area of small group research would be a potentially valuable contribution to the body of knowledge in ISD. The purpose of such grouping is in line with IS industry practice where the pooling of resources for the completion of an IS project has been shown to increase productivity (Hartmann et al., 2009). Sawyer (2004) provided for the concept of the Group Archetype which makes explicit the need for social interaction and collaboration.

Sawyer's group rules and behaviours are an important consideration for group interaction, success and conflict resolution (Sawyer, 2004). Accordingly, the group archetype provides for the explicit enabling of collaboration among the group members (Hartmann et al., 2009; Lynch et al., 2007) as well as the application of the spiral/evolutionary approach to software development, rapid application development (RAD) and joint application development (JAD). This concept has been applied to academia for various reasons. Firstly, for the student to be exposed to the nature of such interactions to become familiar with and to learn the skills necessary enhance such interaction. Secondly, from a practical point of view to expose students to real world problems, via a group-work project, which would certainly place much less of a burden on the IS industry in meeting their social responsibility. The underlying focus of the study is to gain insights into enhancing IS student interactions while working as a collective of up to a maximum of six members. The aim of which is firstly to achieve success in the form of, at least, a passing grade. More so to find the factors that can aid the group to achieve higher performance.

Given the complexity of IS projects, the work is typically conducted by groups thus current theories of group behaviour provide a viable lens through which to study the problem. The concepts of Efficacy on

the individual and on the group as well a group interaction will be elaborated on the next sections of this chapter to determine their relationship to performance, to inform teaching strategy and to aid learning. Small group research will also be applied to help operationalize and interpret the findings on group behaviour. Research on small groups (Blumberg et al., 2012; Campbell, 2006; Hardin et al., 2006; McLeod & Poole, 2010), in particular, groups of students on an IS project is relevant as any positive impact on group performance would be a significant contribution for IS group education practices.

2.8 The impact of group efficacy on group performance

Kim and Shin (2015) had identified that group efficacy is a predictor of group performance. They propose that collective efficacy is a crucial intermediary process that intervene the relationships between cooperative group norms and group positive affect and team creativity. These factors could have significant impact on group performance where group-work tasks are important in organisations as there are tasks where teams would be suited to and would out-perform individuals on the same task (Hsu et al., 2016). Doyle et al. (2005) in prior research argues that group efficacy has significant impact on group performance (Hardin et al., 2006; Lam & Schaubroeck, 2009; Shamir et al., 2000; Stajkovic et al., 2009; Tasa et al., 2007; Tømte & Hatlevik, 2011; Whiteoak et al., 2004).

Findings by Li et al. (2013) indicate that collective efficacy is stronger when task uncertainty is low. Factors that can reduce tasks uncertainty in this environment are related to the fact that each student group is not as independent as industry groups are. Each group has a mentor to consult with, to guide the group activities and sufficient time to define the requirements for their work project and the steps or deliverables on the way to completing the course. According to Peeters, van Tuijl, Rutte, and Reymen (2006) there was sufficient justification for organising work tasks around teams for taking advantage of the combination of complementary skills, knowledge, attitude and other characteristics. According to social cognitive theory (Bandura, 1997) collective efficacy is a shared belief among team members and this positively contributes to team performance by motivating the individual in the group to exert more effort to reach the team goals and to perform group tasks successfully. Bandura (1997) purported that an average indicator across all team is reflective as a shared belief and this would positively correlate to the performance of the group. This group efficacy also provides further insights into understanding team performance.

According to Tasa et al. (2007) who were influenced by Bandura (1997), indicated in their literature research and findings they believe that collective efficacy can influence how people strive towards future goals, how they manage their resources and this can influence their overall performance. According Gibson and Earley (2007) found that collective efficacy is achieved through activities like exchange of information and observed behaviours within the group (Gibson, 1999). Their research is influenced by their model of "collective efficacy emergence from an aggregate amount of teamwork

behaviours in the team" (Tasa et al., 2007). Team work behaviours refer to individual activities that contribute to team process and that teams with higher level of aggregate team behaviour will have higher level of collective efficacy. In this study, it is expected that this group (collective) efficacy will positively correlate to group performance (Kim & Shin, 2015).

2.8.1 The impact of group interaction behaviour on group performance

Group deliberation and interaction behaviour (Black et al., 2011; Gastil et al., 2008) is the behaviour an individual possesses that has been identified to have a strong influence as well as predictive value on group performance. While studying groups observations can be made about the types of interaction behaviour. Research work should monitor the extent to which the team engages in mutual and collective interaction to try to determine if this behaviour relates the level of performance and innovation in the group (Liu et al., 2015).

2.8.2 The impact of peer group behaviour on group performance

Tasa et al. (2007) stated that the relevance of the finding of the impact of peer group interaction behaviour on group performance is important for research on groups. The individual can report on how they feel about other group member's group interaction behaviour. The relationship between the observations of what they observe in peers and what they do is significant. The Social Learning Theory by Bandura purported that behaviour is learned from the environment through the process of observational learning. The influential models such as friends within their peer group are observed and either possibly imitated or adopted when the model is perceived (Bandura, 1989b). The behaviour can be reinforced or strengthened (McLeod, 2011). The attachment to specific models that, possess qualities seen as rewarding, is also important as this could explain why group members replicate rewarding behaviours of other group members (McLeod, 2011). For this research it is only relevant to understand that one group members can have valuable insight about other group member's behaviour. The concept of Identification is said to occur with another person (the model) involves taking on (or adopting) observed behaviours, values, beliefs and attitudes of the person with whom you are identifying (McLeod, 2011).

2.9 Social Cognitive Theory and Predicting Performance.

Brown et al. (2008, p. 300), strengthened the Social Cognitive Career Theory Performance Model which identified academic self-efficacy beliefs to be strongly related to "college performance". Brown et al. (2008, p. 305), then applied it to their study and found that the motivational properties of having robust academic self-efficacy are important to academic attainment.

Figure 2: Information Systems: The Relationship of Efficacy to Performance
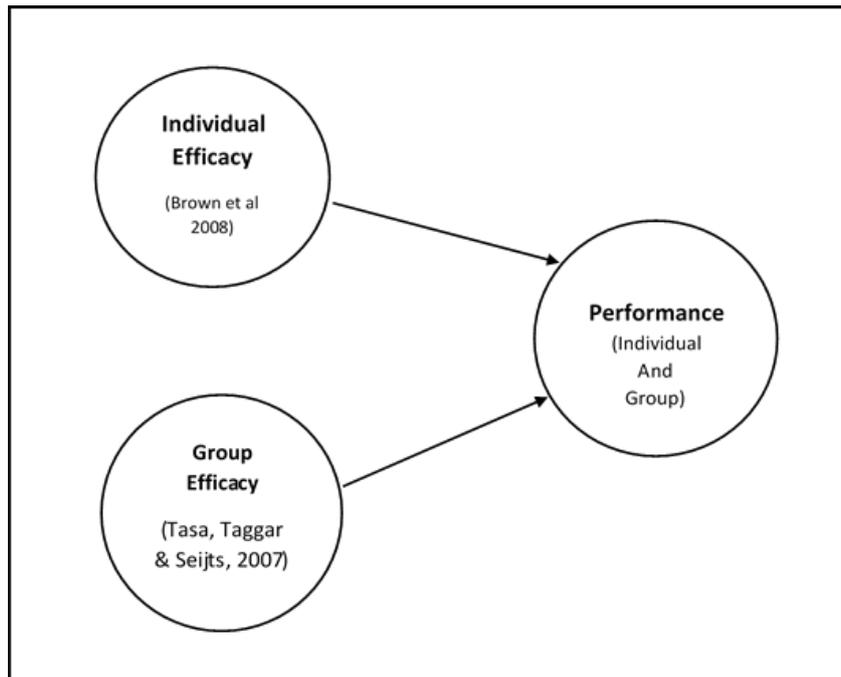
Social Cognitive Theory purported by Bandura has been indicated in various studies as being a predictor of performance. Comments by Weissberg & Owen (2005) on Robbins et al. (2004), highlight the issues associated with predicting performance. This growing support for the role non-academic factors in predicting performance will be elaborated on next. The concept of the Social Cognitive Career Theory Performance Model was applied to this study to explain the factors that impact IS Group Project Performance (IS-GPP). Figure 2, illustrates the proposed research model which combines both individual and group efficacy factors and their relationship to performance. Such a model is on based prior research that was concerned with the two efficacy factors being applied separately, however, it is important to understand behaviours in an ISD group scenario.

2.10   A Framework of Efficacy Factors affecting ISP

Triangulation on a theory that can effectively guide the production of knowledge in this problem area is not clear cut. The literature has indicated that some efficacy measures in ICT and IS have been established, hence a grounded theory approach is not appropriate for such a study. Theories by Compeau et al. (1999) and Hauser et al. (2012) are available and aim to measure the efficacy of end-users to computers, that is the hardware and software of the completed and already available product and is therefore a theory that provides no relevance to the process of development an IS, i.e. artefact and the people involved in the process.

Figure 3: Individual Information Systems Efficacy to Performance Framework (Brown et al., 2008).
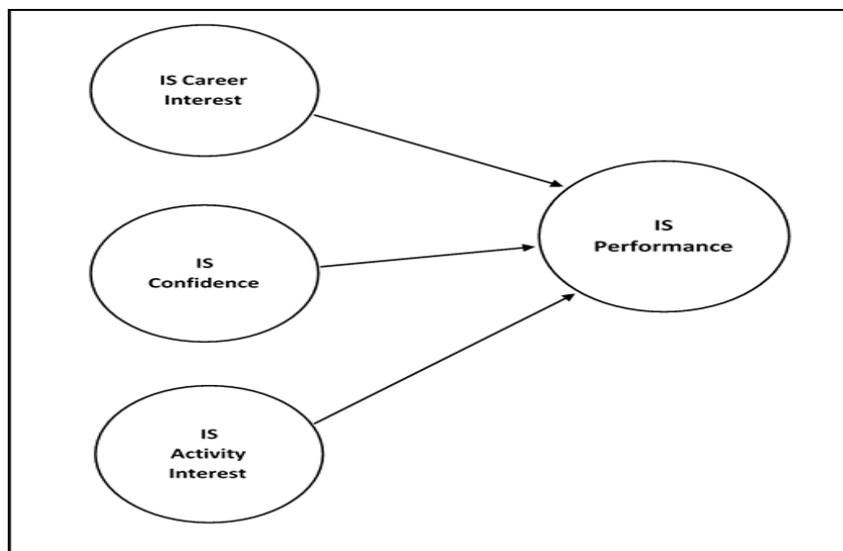
ISP research is, however, concerned with the people involved as "developers" and provides for a self-efficacy focused on measuring the influence and effects of individual (Ajala, 2013; Cherian & Jacob, 2013; Van Der Roest et al., 2011) and group factors on performance (Stajkovic et al., 2009).

Such a theory in IS development would help identify and to establish an IS efficacy to performance framework, see

. The value of a predicator of individual IS performance (ISP) is significant for making enhancements to IS courses, for planning of interventions, for bringing the concepts of teaching and learning closer together as well as for enlightening the IS field (Stajkovic et al., 2009; Van Der Roest et al., 2011).

Figure 2, represents a framework for conceptualizing both IS individual (Self-efficacy) and group efficacy for their influence on ISP. This research presents the exploration of both the individual and

group efficacy factors. Such a framework for conceptualizing both IS individual (Self-efficacy) and group efficacy for their influence on ISP could provide further insights. Liu et al. (2015), suggest that it important observe more than just the existence of the behavioural factors for measuring performance but measure innovation performance. The individual efficacy for ISD can be enhanced by measuring group factors and their combined impact on performance, see Figure 4

Figure 4: Group Information Systems Efficacy to Performance Framework.
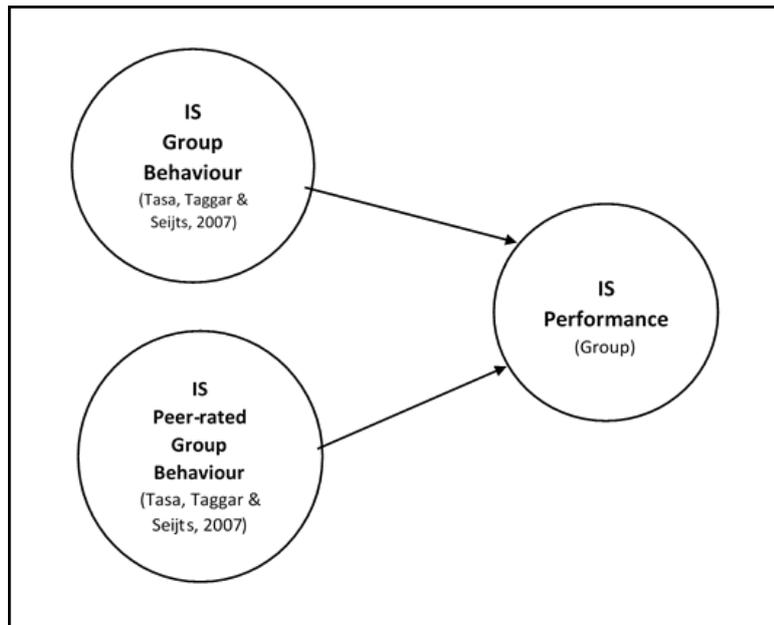
Research that presents the exploration of both the individual and group efficacy factors and the impact on performance could help in understanding and applying behavioural factors that could lead to success and help to avoid those behavioural factors that lead to failure.

2.11   Innovation Performance in Information Systems Development

Liu et al. (2015), recommend that more research be conducted to examine the exact nature of specific behavioural factors for performance of the group at a critical skills level. They suggest the information exchange behaviour and joint decision-making behaviour are critical for the success of the group and critical for achieving innovative performance. Innovative performance is one at a higher level than that of mere performance. Liu et al. (2015), postulates that these factors represent the processes that most directly affect the way in which the group does what they do to achieve higher levels of performance. They focus on examining the collaborative behaviours that teams possess for generating creative ideas and for processing and interpreting complex processes. This they believe is crucial for handling responses to their environment (Liu et al., 2015). This behaviour also produces a positive effect on

collective efficacy. The relationship between collective efficacy, collaborative behaviours and group performance would be important to study (Kim & Shin, 2015).

2.12   Summary of Chapter Two

As identified in the literature, efficacy factors both at the individual and the group level are appropriate for being used to assess ISP and will be applied to this study. The application of the theoretical framework identified for the study would help to understand the phenomenon of ISP and interpret the findings from the study. The precise nature of the research problem has been established, the research methods have been identified and a discussion of the instruments to be applied to gather the necessary data will be presented in the next chapter.

CHAPTER 3: RESEARCH METHODOLOGY AND DESIGN

3.1 Introduction

The previous chapter outlined the applicable literature for the study and provided a perspective of the efficacy factors that will be explored to understand and contribute to solving problems in ISP. The phenomenon under empirical investigation in this study is the impact of individual efficacy, group behaviour and group efficacy, for their predictive capacity, as determinants of performance in an IS academic educational setting. Leedy and Ormrod (2013) and Williams (2007) presented research as the process of collecting, analysing, and interpreting data in order to understand a phenomenon where this chapter discusses the research methodology and design approach for this process. First, the research aims will be discussed, second, the research design, third, the Research methodology is discussed, fourth, the data collection process and the statistical methods used to address the research problem will be discussed and fifth, the sampling procedure is discussed. Thereafter, the dependent variable in the study, the research instrument, the bias, assumption and limitations; the reliability and validity and lastly the future research is discussed.

3.2 Intended Aims

The main approach to learning IS at institutions of higher learning is the group learning approach (Kim & Shin, 2015; Topi et al., 2010). Students work in groups to solve a business problem with an IS solution as an outcome of the course. This research is aimed at establishing a set of guidelines for lecturers to assist students to engage more effectively in group-interactions and to achieve higher performance scores. Correspondingly, the work of this study is expected to determine which efficacy factors are better predictors of ISP. The areas of interest are which individual efficacies are related to ISP and which group efficacy factors are related to ISP. Gaining more insights into these factors will provide more valuable insights into achieving better performance.

3.3 Research Design

Appropriate and plausible answers to the research questions are the goal of any research study and is what guides the very nature of the study to be conducted (Mouton, 2001). The research design then serves as an outline of the enquiry approach and the kind of evidence addresses the objectives of the study. The reason for pursuing the current research is because strong correlations have been observed in the studies identified in the literature. The correlational relationship between two variables is occasionally the result of an outside source, so we have to be careful and remember that correlation

does not necessarily tell us about cause and effect. If a strong relationship is found between two variables, causality can be tested by using an experimental approach (Williams, 2007).

The research design is a correlational (Ellis & Levy, 2009) study but also uses an evaluation approach with quasi-experimental outcomes studies with a strong ability to assess causal outcomes, however, its generalizability is somewhat limited (Mouton, 2001). The focus of the research is to attempt to determine the presence and degree of a relationship between two or more factors (Ellis & Levy, 2009, p. 327). The study will analyse quantitative data to determine if a predictive relationship exists.

3.3.1 Data Analysis

The data received from the questionnaire was coded and entered onto the SPSS statistical program (SPSS Version 21.0 for Windows), Ms Excel and R-Studio. The data, which was collected through the questionnaire, was subjected to descriptive statistics and Spearman's Rho Correlation. Only face validity can be claimed for the research instrument, which was designed by considering the applicable literature outlined above. Ethical clearance was obtained from the University of KwaZulu-Natal.

3.3.2 Empirical versus Non-Empirical Studies

Mouton (2001) stated that non-empirical studies address the overall research problem with questions that are conceptual, theoretical or philosophical. Whereas, he states that, empirical studies contrastingly address the overall research problem with research questions that are exploratory, descriptive, causal, evaluative, predictive or historical in nature. The research questions in this study were descriptive and to some extent exploratory in nature, therefore, the researcher classified it as an empirical study.

3.3.3 Primary versus Secondary Data as the source

The next step in the design process was to decide on the type of data that would be collected. In research studies, there are two types of data sources, the primary and secondary. The primary data sources are those data that are collected directly from the source while the secondary data sources are those data that are derived from previously collected primary data (Leedy & Ormrod, 2013).While secondary data may save time in terms of data collection no such data could be found for this study that would have addressed all the research questions. Therefore, a decision was made to collect primary data.

3.3.4 Quantitative versus Qualitative Approaches

The author of the research in some way knows the type of knowledge and theories that they wish to apply to help them understand the phenomenon so that will determine how to go about gathering the data based on the type of study (Leedy & Ormrod, 2013). Self-Efficacy theory has been examined using a quantitative design (Johnson & Christensen, 2012; Kumar, 2011) and much knowledge has been gathered using this approach. For this research, we will still follow this design approach. However, the key to unlocking the knowledge is the decision about the kind of information that would be used to study the research problem (Leedy & Ormrod, 2013). Research problems can be investigated either quantitatively or qualitatively.

A quantitative investigation involves gathering research information that is in the form of numbers and figures that is used to answer questions about the relationships between variables identified in the study (Leedy & Ormrod, 2013). The purpose of which is to develop generalizations that contribute to a theory (Blumberg et al., 2012). Leedy and Ormrod (2013), suggest that this kind of data is usually collected from large samples over a short period and easily converted to numerical indices. According to Williams (2007, p. 66) the research itself is autonomous of the researcher and thus the data is used to objectively measure reality and create meaning objectively.

On the other hand, a qualitative investigation involves gathering research data in the form of words, sentences or narratives (Leedy & Ormrod, 2013) and is typically used to answer questions about a multifarious situation for a systematic analysis of the environment or research domain (Williams, 2007). The investigation makes use of small samples but because of the nature of information, the data collection can be time-consuming and it requires content analysis to be conducted. In many cases the topic is at an exploratory stage, the research context and the research problem is not well understood (Leedy & Ormrod, 2013).

From the literature review, the factors affecting group performance, in terms of broadly defined themes, have already been established. The purpose of this study was to investigate the themes that were applicable in this research context, with the aim of developing a generalization. Therefore, a quantitative approach was deemed appropriate. Williams (2007, p. 64) stated that researchers typically select the quantitative approach to respond to research questions requiring numerical data. Hence this study is a quantitative study. Quantitative research is driven by investigators with the need to quantify data in order create meaning and new knowledge that is independent of the researcher. As a result, data is used to objectively measure reality; therefore, quantitative research creates meaning through objectivity uncovered in the collected data (Williams, 2007, p. 64). Klopper (2008) highlights that quantitative research designs are acceptable and are widely funded and published.

One of the first research analysis activities is that of identifying the distribution of the data to determine if it is indeed a normal distribution. The data set was analysed and found not to be of a normal distribution. Second, any data points that are significantly different from the other scores would need to be removed. There should be no outliers as outliers should be removed to more accurately analyse the data and to produce results which can be measured skewing the data, e.g. a mean that is not accurate or a p value that is not accurate and be reflective of the population (Hoaglin & Iglewicz, 1987). They suggest the application of an outlier labelling rule with a boundary of G=2.2 as a multiplier as the demarcation criteria. In this research this was applied and the observation below the new upper and lower bounds of (30 and 90 respectively) where removed.

3.3.5 Inferential (Correlational) Research

Leedy and Ormrod (2013) stated that the correlational research method has the research examining the differences between the two characteristics of the study group and they felt that it is crucial to observe the extent to which a researcher discovers statistical correlation between two characteristics depending on some degree of how well those characteristics have been calculated. Hence, validity and reliability are important components that affect correlation coefficients (Williams, 2007, p. 67).

The focus of a correlational type research is to gather quantitative data and to determine the existence and the degree to which the factors or variables are related. Williams (2007) noted that the purpose of a correlational study is to establish whether two or more variables are related. Creswell (2009) defined correlation as a statistical test to establish patterns for two variables. The statistical analysis of the research question can be conducted through a progression or sequence of analyses using a standard test for correlation that produces a result called "r". The r coefficient (Cooper and Schindler, 2001) is reported with a decimal numeral in a process known as the Pearson Correlation Coefficient (Williams, 2007). However, the Spearman Correlation Coefficient was applied to analyse the data as the data is ordinal in nature.

A higher-level goal is to determine if indeed one variable (the independent variable) could be used to predict the value of the second variable (the dependent variable). It is not necessary for the variable to have equal values but rather that a pattern where a higher value in the independent variable will result in a higher value in the dependent variable. Should a linear relationship exist between the two variables it could be determined that one variable indeed determines the next. According to Ellis and Levy (2009) as there no is control placed over either of the variables or no attempt has been made to determine if one caused changes in another, just if the first could be used to predict behaviour of the second, the study would be considered correlational, and not experimental or causal-comparative in nature.

3.4 Research methodology

This study is based on collecting empirical primary data from a survey of student self-efficacy. The survey-based method of data gathering has employed Likert scale items to assess the efficacy factors. Data was collected as a quantitative assessment of the self-reported perceptions of IS student ability to attain various levels of success and achievements in the IS student's academic journey to the work place. The research questionnaire modelled on the recommendations of Brown et al. (2008), measured IS-Career-Interest, IS-Confidence and IS-Activity-Interest as the individual efficacy factors and group behaviour and group efficacy as the group efficacy factors. These constructs have defined the research instrument to assess these independent variables to measure their impact on the dependant variable of IS performance. The type of research is quantitative in nature and as an empirical study it was used to gather primary data. This data was analysed to identify areas that indicated relationships between the independent and the dependant variables in the study and where any further study is required. The study was expected to explore the impact of individual efficacy factors on ability to succeed in IS study commitments.

3.4.1   Research Problem and Questions

Research question have been stated to guide the investigation of the identified factors. Research questions are the essence of most research conducted and acts as the guiding plan for the investigation (Mertler & Vannatta, 2001). According to (Maxwell, 2013) p.117 research questions are "specific questions that researchers seek to answer" and they "state what you want to learn" (Maxwell, 2013). A research investigation has one or more research questions regardless of the type of research. Maxwell (2013) also suggested that a good research question is one that will guide the researcher to the acumens that will lead them to understand what they set out to investigate. Ellis and Levy (2008), highlighted that there should be a meaningful connection between the answers to the research questions and the problem inspiring the study. As this study is quantitative in nature, the questions are formulated as confirmatory and predictive in nature (Mouton, 2001).

The anchor of a clearly identified research problem, as identified in chapter 1, is what individual and what group factors impact IS performance (Ellis & Levy, 2009). Research questions were developed to obtain information that would address this research problem. The main research questions encompass both individual and group efficacy factors that possibly predict ISD performance. This study has aimed to gather information about the individual and group social cognitive factors that impact performance in an ISD project team.

3.4.2 Research Question 1 - What is the relationship between student self-efficacy and performance (RQ1)?

Based on the findings in the literature survey, the objectives of the study and to help answer the above question, the following hypotheses identified in Table 1 as indicated by HI1, HI2 and HI3 were established to evaluate the relationship of IS self-efficacy on student project performance. This will be examined based on the data derived from the Information Systems Self-Efficacy and Group Interaction Questionnaire. The correlation will be observed between the aggregate student self-efficacy construct and the group performance score in final major assessment.

3.4.3 Research Question 2 - What is the relationship between student group-behaviour and performance (RQ2)?

Based on the findings in the literature survey, the objectives of the study and to help answer the above question, the following hypotheses identified by HG-1 and HG-2, as indicated in Table 1, were established to evaluate the relationship of IS self-efficacy on student project performance. This will be examined based on the data derived from the Information Systems Self-Efficacy and Group Interaction Questionnaire. The correlation will be observed between the aggregate student self-efficacy construct and the group performance score in final major assessment.

3.4.4 Research Question 3 - What is the relationship between student group-efficacy and performance (RQ3)?

Based on the findings in the literature survey, the objectives of the study and to help answer the above question, the following hypotheses as identified by HE-1 indicated in Table 1 to evaluate the relationship of IS self-efficacy on student project performance. This will be examined based on the data derived from the Information Systems Self-Efficacy and Group Interaction Questionnaire. The correlation will be observed between the aggregate student self-efficacy construct and the group performance score in final major assessment.

3.4.5 Research Question 4 – In what way does the performance differ between efficacy level groups (RQ4)?

To help understand the relationship between group efficacy and performance; a decision was made to divide the efficacy scores into three categorical group of "low", "medium" and "high". There were 106 respondents which equated to three groups of 35 leaving out one response (Statistics, 2013). Here the

individual efficacy scores were used as a source but the efficacy scores were sorted lowest to highest to produce three groups. These three groups were used to group the performance scores of those individuals who fall into the respective groups. Using three or more group is a common method to compare the relationship between any two variables (Statistics, 2013). In this case, the Kruskal-Wallis test, a non-parametric procedure, was used to compare the difference between the groups. To determine whether performance is significantly different between the data and has met the assumptions for the test. The assumptions include the dependent variable (performance) is continuous, that the independent variable (efficacy) consists of two or more categorical groups, that there is no relationship between the observations and lastly that the distributions in each group have the same shape (i.e. variability). This will be examined based on the data derived from the ISG - Information Systems Self-Efficacy and Group Interaction Questionnaire. The correlation will be observed between the aggregate student self-efficacy construct for each of the efficacy groupings to the group performance score in final major assessment. The statistical significance of the difference between the means will be conducted.

3.4.6   Derived Hypothesis:

Maxwell (2013, p. 69), reiterated that research questions are not the same as research hypothesis where a hypothesis can rather be defined as a logical supposition or an educated conjecture. Hence, a hypothesis is prediction of the outcome of a relationship between variables (attributes and characteristics) and is common in quantitative studies such as this one. They are ideas defined before the research is conducted. This requirement of preparing the hypothesis prior to the research and viewing of the data is critical as assumptions of the statistical tests are honoured. Any framing of hypothesis after the study has been conducted is an approach used in qualitative research to guide the process for further investigation. Examining of the data and creating new or revised hypothesis is rather for future research (Maxwell, 2013). Table 1 identifies both the individual and the group hypothesis to be tested in this study. The following research hypotheses have been stated for this research and the alternate hypotheses are identified by H1-7 as indicated in

Table 1: The Individual and Group Hypotheses

H₀	The variables are not related.	Null Hypothesis
H_1	There is a relationship between IS-Career-Interest and Individual IS Performance.	(IS) - Career Interest (HI-1)
H_2	There is a relationship between IS-Confidence and Individual IS Performance.	(IS) -Confidence (HI-2)
H_3	There is a relationship between IS-Activity-Interest and Individual IS Performance.	(IS) -Activity (HI-3)
H_4	There is a relationship between group efficacy and group performance.	(IS) – Group Efficacy (HGE-1)
H_5	In what way does the performance differ between efficacy level groups.	(IS) – Group Efficacy Level (HGL-1)
H_6	There is a relationship between group behaviour and group performance.	(IS) – Group Behaviour (HG-1)
H_7	There is a relationship between peer-rated group efficacy and group performance.	(IS) – Peer-rated Group Behaviour (HG-2)

3.4.7 Individual versus Group Level Analysis

DeCoster (2002, p. 1), advises that for any analyses to be accurate they must properly account for the influence of the groups on the response measures. A technique for analysis called Analysis of Variance (ANOVA) which is used to examine data from interacting groups should be applied. Such tests have the capability to explain the variability in a single response variable from a set of predictor variables. The predictor variables are generally referred to as the independent variables (IVs) while the response is called the dependent variable (DV).

DeCoster (2002, p. 2), further advises firstly to determine if the DV is measured at the group level or at the individual level. Accordingly, measurements made at the group level describe the characteristics or performance of the group while those at the individual describe the characteristics and performance of the individual group members separately. Measurements in this study are expected both at the individual and at the group level.

3.5 The Sampling Procedure

The sampling procedure involves extracting a representative sample which includes all the elements of the research domain under study (Leedy & Ormrod, 2013), where a population is the aggregate of all elements from which a sample is selected. The target population is the collection of respondents who form the entity to be surveyed, information gathered from and from which conclusions are drawn. The target population in this study is all students registered for the third year IS&T course. The population parameters cannot be determined precisely in a sample since not every element in the target population is included in the research design.

3.5.1 The Sample

The fundamental premise about choosing a good sample is that it should be illustrative of the population. It was vital in this study to ensure that the data collection instrument chosen measured as accurately as possible the efficacy factors that the study intended to measure (Sekaran & Bougie, 2013). Considering the number of students and their geographical locations, a survey best suited this study because it is an efficient and inexpensive means of collecting data (Sekaran & Bougie, 2013). The most important requirement of a good sample is that each unit in the target population should have an equal chance of being included in it. When making inferences about the target population, most researchers use a probability sampling procedure. Sampling methods can be divided into two broad categories: non-probability sampling and probability sampling.

3.5.2 Sample frame and size

The sampling unit refers to the entity which is the focus of the survey. To select the units for sampling a sampling frame is utilized which could be obtained from a census list, telephone directory, map, pay roll or from the membership lists of organisations. The sampling frame is appropriate as it comprises the complete list of all the units which the sample is drawn. According to Sekaran and Bougie (2013, p. 226), by studying the sample, which is a subset of the population, the researcher may draw conclusions or make inferences that allow generalisations about the target population. The selection of the sample can be ascribed to several factors of which the most important is that it is a laborious exercise, and it is not feasible, to study every single element in the population. Even if it were possible the financial costs demanded would be enormous (Leedy & Ormrod, 2013) and the quantification of such volumes of data would be a slow and arduous task (Leedy & Ormrod, 2013; Sekaran & Bougie, 2013). Studying small sample groups is likely to yield reliable results and facilitate data collection, whilst lessening the impact of error.

The current class list is the sampling frame; it contains the full complement of all students registered for the course on both campuses. This list is not used directly as all students are important and a survey of the entire population is the preferred method. A sample size of the total number of participants who were selected to participate in the research study became the targeted population, that is, a census. Following the guideline of Johnson & Christensen (2012) that if population is 571, then 242 respondents should be selected, based on the 95% confidence level and 5% error. However, to increase validity of data results the survey was presented to all 140 students but only 106 completed the survey.

3.5.3 Non-probability Sampling

In non-probability sampling inferences, cannot be made to the target population as the sampling error cannot be estimated, there is no way of estimating that any element will be included in the sample, and there is no method of finding out whether the sample is representative of the population Sekaran and Bougie (2013). Researchers may choose non-probability sampling when lists or sampling frames are not required or available. A disadvantage of the non-probability sampling procedure is the reliance on chance and judgement on the part of the researcher (Martins, Loubser, & Van Wyk, 1996; Sekaran & Bougie, 2013). However, if statistical inferences are required as an objective then a probability sampling procedure should be employed (Sekaran & Bougie, 2013).

3.5.4 Probability Sampling

A probability sampling procedure is one in which every element has a known non-zero probability of being selected (Martins et al., 1996, p. 253). Probability sampling is widely used by most researchers because of its simplicity and is alleged to be the most objective method of sampling a population. Here, each unit in the target population should be identifiable to have a positive chance of being selected. However, there are some difficulties that may be experienced because of some aspects being beyond the control of the researcher, for example, where lists or maps contain information about the population that is in-complete or out-of-date and can lead to sampling errors. Conclusions drawn from such samples may not necessarily be generalizable to the entire population (Leedy & Ormrod, 2013; Sekaran & Bougie, 2013). For the present study, the probability sampling procedure of a census was adopted and not a sample.

3.5.5 Respondents

Population is the entire group that the researcher is interested to research about (Gilbert, 2008). In this study, the population comprised of subjects who were students in the age group of 18-24 years. A census study of this population (N=140) of respondents consisted of male and female participants taking the third-year Information Systems and Technology major in the Discipline of IS at the University of

KwaZulu-Natal, Durban and Pietermaritzburg. The class group was composed of students registered for the Computer Science and the Bachelor of Commerce, majoring in Information Systems and Technology, degree programs. For the purposes of reporting, student information was kept anonymous and any identifying information of each student was replaced systematically by a corresponding number.

The population was from the: Information System and Technology 31B (ISTN31B) course which is a component of the major in Information Systems and Technology within the Bachelor of Commerce degree programme offered at UKZN. The subjects are the students registered for the course. This twelve-week course is offered in the first semester of the year to facilitate the learning of ISD using a group project-based approach. The student voluntarily answered the questionnaire.

The university has five campuses in two major cities, four in Durban and one in Pietermaritzburg, with a total student population of approximately 42000. This new institution, according to the Institutional Profile document (UKZN, 2009), the University of KwaZulu-Natal (UKZN), South Africa, formed as a result of a merger of two previous universities in 2004, is a large contact university. The new Discipline of Information Technology, henceforth known as the "department", within the School of Management, Information Technology and Governance of the College of Law and Management Studies at University of KwaZulu-Natal. The department had employed the traditional systems development life cycle method (SDLC) for ISD teaching and later changed the ISD approach to an agile approach to ISD. The change to agile, although relevant, will not be directly considered in this study. However, it is important for future studies and ongoing research by colleagues.

3.6 Information Systems variables under study

3.6.1   Information Systems Performance – The Dependent Variable

For the purposes of this research, the phenomena (IS performance) and explaining the causality and interdependency between these (Hirschman & Reed, 2014). Hirschman and Reed (2014) stated that this is what is required of Explanatory Research. The three axioms of sound methodology namely reliability, validity and representativeness and generalizability will be strictly adhered to (Hirschman & Reed, 2014) and that an academic study of this nature in IS, is a descriptive one that expresses beliefs and opinions. The method of research is one of an exploratory nature. IS performance will be measured using two assessments (namely, Milestone 1 and 2) for the semester culminating in an overall mark (score) allocated to each student within the group.

For the purposes of this research both the summative (overall) assessment mark will be used to represent the final performance mark. What follows is a more detailed description of the process used to determine the final mark which will be used as the performance score for this study and the dependent variable.

The current performance mean is the mark for a student that is obtained in the course under investigation. This study will use the final course mark for a group for the semester course. The source of this marks are the student mark system and not a self-reported mark by the respondents.

The course is the third-year module: Information Systems and Technology: Analysis and Design, ISTN31B, (S1) as part of the Bachelor of Commerce Degree within the IS major of Information Systems and Technology. Here Students' work in group to produce a design of the proposed information system that is to be developed at the end of the second semester. The IS-SaGE questionnaire will be handed out during mid-semester before the second assessment (M2) as indicated in Table 2 which identifies the timing of the assessments and the research survey. The end of the semester the final calculation performance score will be used as the performance measure for the semester.

Subsequently, the students will register for the second semester for another related third year module: Information Systems and Technology: Analysis and Design, ISTN32B, (S2), where this course will be the implementation part of the course where students will complete the development of the system to produce a functional IS. For the purposes of this study, only the first semester subject will be used to compare to the efficacy scores.

Table 2 : Course schedule and timing for conducting the research survey

Course Schedule				
Semester Timeline	Quarter-way through	Mid-Semester	End of Semester	Summation
Performance Assessment:	Milestone 1 (*M1*)		Milestone 2 (*M2*)	Final Performance Calculation (FPC), i.e. final examination mark.
Survey:		IS-SaGE		
Key:	IS-SaGE	IS-SaGE - Information Systems Self-Efficacy, Group Efficacy Factor Questionnaire.		

The FPC as indicated in Table which shows the course schedule identifies a measurement on a continuous scale that determines final academic performance assessment mark derived from the M1 and M2 assessments. It would be beneficial to academia and to the IS field if this dependent variable in this study could be changed or impacted based on changes in one or more of the efficacy factors will be examined for their relationship to IS performance. This study will use the final course mark for a

student, aggregated for the group, for this purpose. The source of this mark is the student records department of the University of KwaZulu-Natal and not a self-reported mark by the respondents.

3.6.2 Information Systems Efficacy – The Independent Variable

The independent variable in this study of ISP is that of individual efficacy, group behaviour and group efficacy which is from the point-of-view of the group. This will be compared to the group performance of the student group's final group mark achieved at the end of the semester. This dependant variable, mentioned before, is expected to be impacted by this independent variable operationalized within Social Cognitive Theory and various related and overlapping behavioural factors with in small group theory.

3.7 Instrument

The study is expected to explore the impact of individual efficacy factors on ability to succeed in IS career study commitments, and later the real-world IS work-task commitments, as determined by the projects they are exposed to. Therefore, gaining insights from studying IS students would contribute to the body of knowledge in ISP. Important processes and procedures produced by this research endeavour could be formulated with the aim of providing guidance on developing information system field interventions and on developing academic programmes for social cognitive awareness for students to enable performance improvements. Thereby reinforcing the role of IS academia in imparting academic as well as real-world IS solutions. As yet there has been no identified universal remedy for the problems in ISP. However, using the artefact by Brown, et.al, 2008; a research questionnaire was created to measure selected social cognitive factors. IS-Career-Interest, IS-Confidence and IS-Activity-Interest are the constructs that are defined by the research instrument. They encompass the variables of interest for assessing the areas where performance improvements can be identified. The type of research is quantitative in nature and as an empirical study that will gather primary data to be analysed to identify areas where further study is required.

The questionnaire, called the Information Systems Self-Efficacy (IS-SaGE), as indicated in Table 2, provided a brief overview of the purpose to the intended audience of the survey and a question confirming their participation in the study. Likert scale questions were used to establish the respondents' perceptions of their confidence in their ability to succeed in a career in ISD, assessing their interest in such a career, their perceptions of performing ISD activities and their group behaviour information. In the questionnaire, shown in Table 3, the respondents indicated how much they agreed with each item on a scale from one to five. Each number notes a certain measurement such as: (1) strongly disagree, (2) disagree, (3) undecided, (4) agree, and (5) strongly agree. A high score on the scale indicated a positive opinion and vice versa, a low score on the scale indicated a negative opinion.

A census approach was utilized and the questionnaire surveyed one hundred and sixty respondents from twenty six (26) groups over two campuses to provide, among other information their student number and group number, that will be used to extract their related performance assessment marks for the course as the marks are not self-reported in the survey. The census will be conducted to measure the identified factors and their relationship to IS performance.

3.7.1 Measures

Individual performance is measured as the final course mark for each respondent which includes a combined percentage of all formative assessments and a final summative assessment. The group performance is determined as the mean of the individual group members. This can be used in two ways, first as an overall efficacy mean of all subjects compared to an overall performance mean of all subjects. Second, a mean efficacy per group can be compared to a performance mean per group to try to gain understand of the relationship of group efficacy to group performance.

Table 3 : Structure of the research questionnaire

Section	Part A
Topic	Understanding of how respondents spend their time during academic group activities.
Items	6
Type	Sr, Single option variable response.
Participants	All participants
Section	Part I
Topic	Constructs SE - Confidence
Items	4
Type	Sr, Sd, 5-point Likert Scale from "very little conf." to "very high conf.".
Participants	All participants
Section	Part II
Topic	Constructs SE – IS Career Interest
Items	13
Type	Sr, 5-point Likert Scale from "strongly disagree" to "strongly agree".
Participants	All participants
Section	Part III
Topic	Constructs SE – Activity Interest
Items	11
Type	Sr, Sd, 5-point Likert Scale from "very little Interest" to "very high Interest".
Participants	All participants
Section	Part IV
Topic	Constructs GE – Group Behaviour
Items	19
Type	Sr, 5-point Likert Scale from "strongly disagree" to "strongly agree".
Participants	All participants
Section	Part V
Topic	Constructs GE – Peer-rated Group Behaviour
Items	19
Type	Sr, Sd, 5-point Likert Scale from "never" to "very frequently".
Participants	All participants
Section	Part VI
Topic	Group interaction activity leading to greater performance.
Items	1
Type	Open Ended
Participants	All participants

Individual IS Efficacy is a composite construct conceptualized as three sub-scales including IS-Career-Interest, IS-Confidence and IS-Activity-Interest. The three sub-scales were constructed as per the guidelines in the study by Brown et al. (2008). The instrument used for gathering the primary data for the study is a questionnaire. It was not anonymous, as it required the respondents to provide their student number. The student number was requested only to lookup the respective student records to determine their individual performance mark in the IS course. The schedule of when performance assessments where conducted reflects that performance score was calculated based on the M1 and M2 assessments, as indicated in Table 2. A pilot test for the questionnaire was conducted where fifteen questionnaires were administered to fourth level (honours) IS students studying software engineering. The purpose of the pilot test was to identify any shortcomings or misunderstandings embedded in any items in the questionnaire.

Group IS Efficacy is a construct conceptualized as two sub scales which are group behaviour and Peer-Rated Group interaction behaviour. These two additional scales will be used to assess the student's efficacy about their personal or individual group interaction behaviours as well their own perceptions as a rating of their group's interaction behaviour (Seijts et al., 2000).

No demographic information was directly gathered as these could be determined from the institutions student IS using the student's institution provided academic registration number. Permission was obtained during ethical clearance process to access student records for the demographic information.

3.7.2   Parts I, II and III: Individual Efficacy Factors

These parts address the individual efficacy factors of IS Confidence, IS Career Interest and IS Activity Interest. These relate to the individual efficacy research question (Research Question 1) "What is the relationship between student self-efficacy and performance (RQ1)?".

3.7.3   Parts IV and V: Group Behaviour Factors

These parts address the group efficacy factors relating to the group behaviour research question (Research Question 2), "What is the relationship between student group-behaviour and performance?".

3.7.4   Part VI: Group Efficacy Factors

This part addresses the group efficacy factors relating to the group efficacy research question, (Research Question 3), "What is the relationship between student group-efficacy and performance?".

3.8 Research Bias, Assumptions, Limitations and Delimitations of the Study

3.8.1   Research bias

The researcher chose to make use of a sample size that included the entire population of students registered for the degree at only this institution. This meant that the participants (sources of data) were easily accessible and it also meant that the sample did not represent the entire spectrum of the general population of student's at all South African universities. This was because only those sample data were collected and the subjects selected to participate in the study. However, there is no evidence to suggest that other subjects that were not available at the time of data collection would be different to those surveyed on a different day and time (Leedy & Ormrod, 2013; Mouton, 2001).

3.8.2   Assumptions

Leedy and Ormrod (2013), state that assumptions are the foundation of any proposed research study and are the things that the researcher takes for granted but should not be the source of misunderstanding for other reviewers of the research. These impact the inferences made of the findings in the current study. These will include aspects that the researcher accepts to be true without concrete proof. For this study the following assumptions were made are the fact that the subjects are not coerced or forced in any way into participating in the study and completing the survey as is the reason that a question is asked to subjects to verify that they are taking the survey at their own free will.

In this study, we did not ask subjects to provide their performance scores but we asked them to provide their student number which was used to lookup their performance scores in the course. This study has been conducted at a South African University but the results can be inferred to other South African universities or international universities this as they follow the IS2010 standards for the curriculum (Topi et al., 2010). The qualification, Bachelor of Commerce: Information Systems and Technology offered at the University of KwaZulu-Natal which is an internationally recognised course as per the South African Qualification Authority (SAQA). The Department also makes use of Microsoft Visual Studio and MS SQL Server as the standard tools for software development.

3.8.3 Limitations

Leedy and Ormrod (2013), define a limitation as an overpowering threat to the internal validity to the study. The quasi-experimental design involves non-random selection of study participants (Johnson & Christensen, 2012; Saunders, Lewis, & Thornhill, 2012; Sekaran & Bougie, 2013). Therefore, control is limited and true experimentation is not possible. Since the variable cannot be controlled, validity may be sacrificed" (Williams, 2007). Also, the types of studies where efficacy and behaviour are measured there is the inherent limitation of subjectivity from the gathering of research directly from the IS "actors" (Cecez-Kecmanovic et al., 2014). Gathering insights from these actors allows us to gain an understanding about their configurations and reconfigurations through important investigations and questioning processes.

Despite attempts to gather the best possible quality information, there were several limitations to this research study:

- Self-reported data has a threat to the validity and reliability of the models (Maxwell, 2013; Sekaran & Bougie, 2013). Through self-representation.
- In this study the questions were pre-defined by the researcher; this eliminated the possibility of addressing any other relevant question which could have arisen during the data collection. Also, the type of data gained was limited to the responses defined in the research instrument. It is for this reason that Mouton (2001) reports that descriptive, survey-designs lack depth (or topic coverage).
- There does not seem to be a single, comprehensive database of efficacy measures for IS. Furthermore, since there was no consistent definition of Information Systems self-efficacy in the literature.
- Another limitation was the researcher's assumption that the participants were honest in their responses. Additionally, the results were an interpretation of the responses received and thus are subject to cognitive biases (Mouton, 2001).
- The response rate was representation of the required population size, however the sample size was small; hence the generalizability of the results to other departments is limited by the nature, small size and low response rate of the sample (Leedy & Ormrod, 2013).
- Lastly, the time available to conduct the study was short (1 semester) and a longer more longitudinal study would help to investigate further.
- As per Gladstein (1984), factors concerning the nature of the task, that is, task dimensions and the associated variance of group processes and interaction on group performance are important considerations in measuring group effectiveness, however, were not be examined in this study. Hence impacting generalizability of the results (Leedy & Ormrod, 2013).

3.8.4   Delimitations

According to Leedy and Ormrod (2013) the goals of research outline the intention of the research; however, often there is no clear description of the delimitation of the boundaries of the research. Accordingly, this impacts the external validity or generalization of the study results. Examples include a situation where the subjects are of the male gender, or the age group is specific and in these cases generalizations about the findings cannot be warranted for other genders or other age groups. In this study generalizations about the findings can only be made about students studying IS or Information Technology in a team based approach. These can include students in South Africa or around the world as the level of technology, the approaches to learning and the curriculum is standardized (Topi et al., 2010).

3.9 Reliability, Validity and Future Research

The phenomena of individual and group efficacy are being explored in this research. Hence, the extents to which the researcher (s) can learn something from this research and draw conclusions from the results impact the reliability and the validity of the findings.

3.9.1   Reliability

According to Leedy and Ormrod (2013) the reliability in a study is assessed the level of consistency by which the instrument measures the data and produces results while minimizing the opportunity of discrediting the results. Reliability can be established in four different ways: equivalency, stability, inter-rater, and internal consistency (Punch, 2009; Rubin & Babbie, 2012; Saunders et al., 2012). Equivalency reliability is concerned with how closely the measurements taken with one instrument match those taken with a second instrument under similar conditions. In this research the instrument has been revised from other domains to produce a new instrument and can only be compared in future studies. Stability reliability is concerned with the consistency measurement using the instrument over a period. For this study that can only be determined with continued research in this domain of measuring efficacy for ISD teams. Inter-rater reliability is concerned with the level and extent of agreement between the results of individuals being measured by the same instrument. This will be established in

the correlation produced in the results. Individual efficacy research and the research group behaviour (Tasa et al., 2007) the questions were revised and refined for measuring IS individual self-efficacy for ISD and IS group efficacy for ISD to provide a suitable and valid design.

The completed questionnaire had a good internal consistency as indicated by a Cronbach's alpha value of 0.806, which indicates that the scales are acceptable and can be used to interpret the data (Cronbach, 1951). Cronbach's alpha is the most widely utilised way to measure reliability. An alpha value of 0.7 or higher is acceptable (Hartmann et al., 2009). The Cronbach's alpha does, however, not assume that measures of items are evenly weighted (Maxwell, 2013; Sekaran & Bougie, 2013). A composite reliability for each factor should be above 0.70 threshold, hence, Cronbach's alpha is utilised in this study and the composite reliability values of all constructs exceeded the 0.70 ranging from 0.769 to 0.950.

3.9.2   Validity

The design of every study should take into consideration any risks to the research in terms of validity and reliability (Maxwell, 2013). These factors influence the extent to which the researcher can gather knowledge about the phenomenon under study and make inferences from the study sample being researched for application to other areas of research or domains and to reality. Validity of a study is assessed using the following types of validity; internal, face, criterion, construct, content, statistical conclusion validity and external validity.

Internal validity is related to examining one or more of the other types of validity, face, criterion, construct, content or statistical conclusion validity. It is concerned with how accurate conclusions can be drawn about the causality and the relationship discovered in the data being analysed (Maxwell, 2013). This study is not truly attempting to establish causality with regards to efficacy factors and their relationship to ISP; but the research is explanatory in nature, hence internal validity is not crucial in this case. However, all respondents were provided with an equal opportunity to voluntarily participate in the study and all respondents were treated the same. Hence, there were no restrictions of students by campuses, gender, races, culture or other factor in the study. Moreover, the testing of the instruments was conducted using more senior (honours-level) students, hence this limited the impact on internal validity where respondents would have had repeated exposure to the test thereby risking the internal validity (Morrison-Beedy & Melnyk, 2012). The instrument design is also based on other instruments where the validity has already been established in the related studies.

Face validity is concerned with the reasonableness of the design of the study. That is from a superficial point-of-view does the study seem reasonable and this affects the validity. From this point-of-view this study is reasonable (Maxwell, 2013). Criterion validity is concerned with the instrument and its

application and validation in prior studies (Maxwell, 2013). This instrument is designed based on previous studies that are more generic in nature, for example: computer self-efficacy, where they study efficacy factors that are not specific to ISD. The instrument was then adapted from (Brown et al., 2008), in terms of the theory on Individual Efficacy, also well on Group Efficacy (Group Behaviour) from the study by (Seijts et al., 2000).

Construct validity is concerned with where the constructs of self-efficacy and group efficacy show stability across the methodology and are the data a true reflection of the instrument chosen (Maxwell, 2013). The instrument has been used before for this type of measurement and has bene adapted for measuring ISD efficacy. According to Maxwell (2013), Content validity is concerned with whether, in survey-based research, the items in the instrument reflect the content universe that the instrument will be generalized (Boudreau, Gefen, & Straub, 2001; Leedy & Ormrod, 2013). The instrument has been validated in other studies; hence the construct validity should be adequate.

Statistical conclusion validity is concerned with whether the relationship between the variables under study can be explained by the theory being applied or are the relationships merely by chance (Maxwell, 2013), Questions like these can be answered by investigating the patterns in the data particularly for the variance. This can be performed by using the analysis of variance method (ANOVA). ANOVA is a method used to quantify the dispersion of data sets from the mean. Here the greater the distance the sample mean is from the overall mean the greater the variance and vice versa (Minitab, 2016).

Hypothesis testing is based on probabilities; hence we can expect to encounter Type I and Type II statistical errors. It is important to understand how such errors can be avoided or minimised as well as the risks of these two errors. Such errors are inversely related and are determined by the level of significance and the power for the test; therefore, determining which error has more severe consequences for your situation is vital and should be done first. Consider the risks of making these errors when you are conducting your hypothesis tests. The choice of a level of significance to reduce the consequences of making these errors is important (Minitab, 2016).

For this study, a significance level for the hypothesis tests has been set at 0.05 which indicates a 5% chance that the conclusion is wrong when rejecting the null hypothesis. Type I error occurs when the null hypothesis is true and you must reject it. An, α, of 0.05 indicates that you are willing to accept a 5% chance that you are wrong when you reject the null hypothesis. To lower this risk, you must use a lower value for α. However, when using a lower value for alpha means that you will be less likely to detect a true difference if one really exists. Alternatively, when the null hypothesis is false and you fail to reject it, you make a type II error. The probability of this error is β, which depends on the power of the test. You can do this by ensuring your sample size is large enough to detect a practical difference when one truly exists. Again, for this study, the sample size is small, hence the power is not enough and the chance of a type II error occurring has not been minimised or eliminated (Minitab, 2016). External

validity is concerned with the extent to which the results of the study apply to situations and environments outside the study (Maxwell, 2013). This is related to the extent to which conclusions can be drawn from this study and how they would be applicable to other studies, the ability to generalize the findings of the sample to the population of interest (Maxwell, 2013). It is expected that the findings and insights from the current study can be applied with confidence to studies in a similar environment to solve the problems associated with individual and group IS development both in an academic and IS field environment alike.

CHAPTER 4: ANALYSIS OF RESULTS

4.1 Introduction

This chapter presents and discusses results from the survey used to collect the primary data for the study. This will include both descriptive statistics and inferential statistical analyses of the data under review. Responses of this study were analysed using the Statistical Package for the Social Sciences (SPSS Version 21.0 for Windows), Ms Excel and R-Studio. The results of part A of the questionnaire are presented and then each research question is presented in two sections. Section A presents a descriptive analysis that provides answers for the research questions. Section B presents inferential analysis of the research model used in this study to answer and to provide more profound insights for the research questions. Generally, reliability and validity are presented first, however, in this study they are presented together with the other analyses of this study.

Descriptive statistics use numerical and graphical means to find patterns in a data set for the purpose of summarising and presenting respondents' characteristics in a clearer manner (McClave, Benson, & Sincich, 2011). This section presents data of study respondents which include IS activity hours of the respondents. Figure 6 illustrates that many respondents prefer to engage both in the face-to-face mode and the online mode of engagement for communication to complete group-work tasks. Such a finding is important as UKZN is a full-time contact university where face-to-face interaction is the norm. Accordingly, when students are off-campus they would have no aversion to working online to engage to perform work tasks and to interact to complete work tasks. Preference to only face-to-face engagement compared to online-only engagement does differ quite considerably, where the face-to-face only group (27%) is much greater than that of online-only (4%). This further strengthens the case for encouraging such student's engagement to complete work tasks using a combined approach but with a focus on face-to-face engagement. However, together they are still less than respondents who chose both approach (69%) which is a finding that supports the introduction of IS curriculum where is both a component of face-to-face and online work.

4.2 Results of Part A – IS Activity Hours and Group Interaction Preference Descriptive Analysis

Part A from the questionnaire presented the respondents with questions that sought to understand how they spend their time with regards to academic activities for group work. Figure 5 indicates that respondents spend a similar amount of time on both desktop internet and mobile internet hours, spending 8 hours respectively. Such activity-hour results reflect that students do not only make use of the traditional personal computer-based internet but also mobile device-based internet for completing

work tasks. It would be interesting to understand the kind of usage and cost model of students to gather further insights into student ISP behaviour. UKZN, via the Information & Communication Services Division (ICS) (UKZN, 2009), provides computers to students via the institutional computer laboratory facilities hence they have access to desktop computers; however, it would also be useful to understand if they also have access to their own PC, or not, and whether this impacts their mobile computer usage while completing their work tasks. This could account for their current equal internet-hour preference ratio of eight hours to eight hours and another access pattern could impact their preference. This as student preference could be related to or limited by the current access.

Figure 5 : IS-Activity Hours Per Week
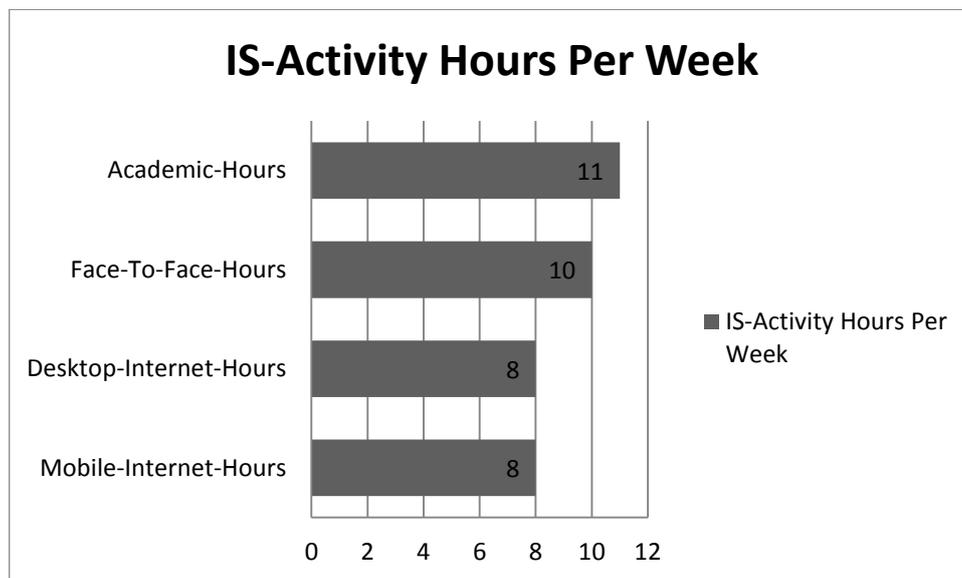
Students, however, spend at least 10 hours in face-to-face engagement for group-work tasks reflecting that this mode of communication and engagement is an important factor for complete assigned work tasks, as indicated in Figure 6.

Figure 6 : Group Interaction Preference
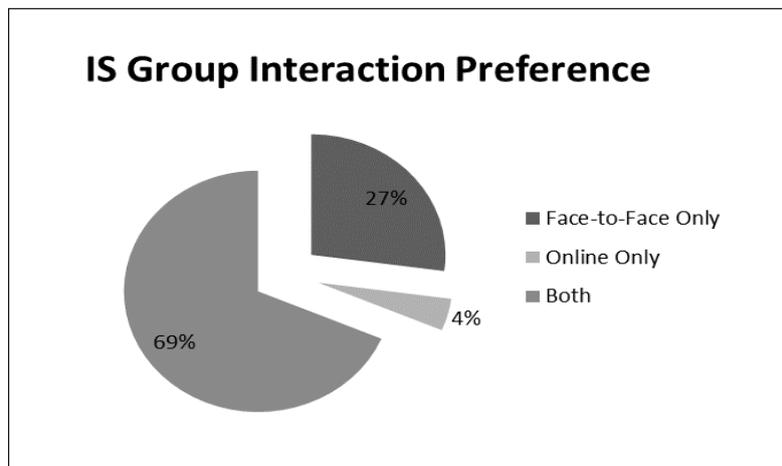
At UKZN it is generally found that there are students who live on the campus who possibly could engage in face-to-face communication as they attend lectures and could be available after lectures and possibly in the evening and on weekends for face-to-face meetings. The only problem with this scenario is that it would only by coincidence that a group would consist of members of students who only live on campus as this is not the criteria for group formation.

By the very nature of UKZN being a university that serves the province of KwaZulu-Natal, further anecdotal evidence suggests that there is the case that there are many students who travel, often long distances from home to attend lectures and would need to leave the campus by a certain time to travel to return home. It is possible that these respondents could fall into the groups who will prefer online-only or both approaches for completing group-work tasks as the time between lecturers and after lectures might not be sufficient. These respondents could be making use of telephone calls or internet-enabled applications or approaches to communicate to complete group-work tasks.

Figure 7 : Gender of Respondents
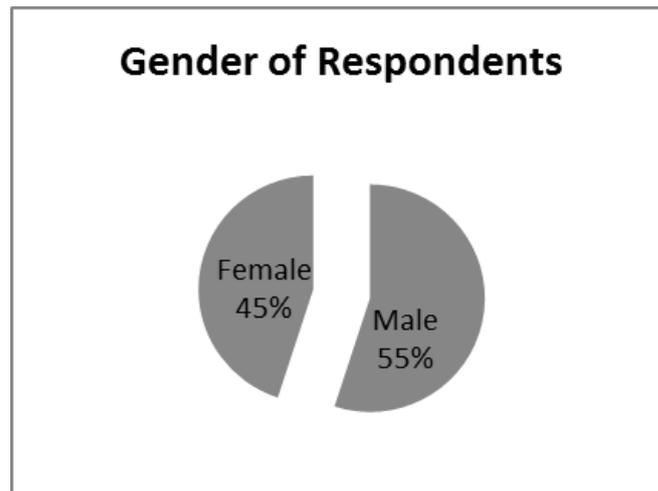
The university provides for tertiary education to students with a demographic of ages in range of 18 to 24 years (UKZN, 2009). As indicated in Figure 7, the gender of the respondents does not differ significantly where the female respondents are at a proportion of 45% and male respondents at the proportion of 55%. Of the original population of 140, only 106 respondents participated in the survey, the target age group of respondents for this study was between the ages of 18 and 24. The demographics of the respondents per campus reflect that 13.11% and 86.89% were from the P (Pietermaritzburg) campus and the W (Westville) campuses, respectively.

4.3 Research Question 1 - What is the relationship between student self-efficacy and performance (RQ1)?

Research Question 1 (RQ1) is meant to establish the relationship of and the predicative capacity of individual efficacy for determining ISP in a third-year IS academic course. It is expected that the results of such an analysis could provide insights into building academic programmes for IS teaching and learning and possibly some knowledge for IS field interventions.

4.3.1 Individual Efficacy Descriptive Statistics (Section A)

The results for the IS – Career Interest variable, as indicted in Figure 8, reflect that there is a high level of agreement between respondents overall for this individual efficacy factor of Career Interest which corresponds to the study by Brown et al. (2008). Respondents have much variability in their individual responses reflected in the individual Likert items, however, it is quite clear that there are stronger responses on the scales from Agree (4) and Strongly Agree (5).

Figure 8: The Sub Scale: Information System (IS) – Career Interest
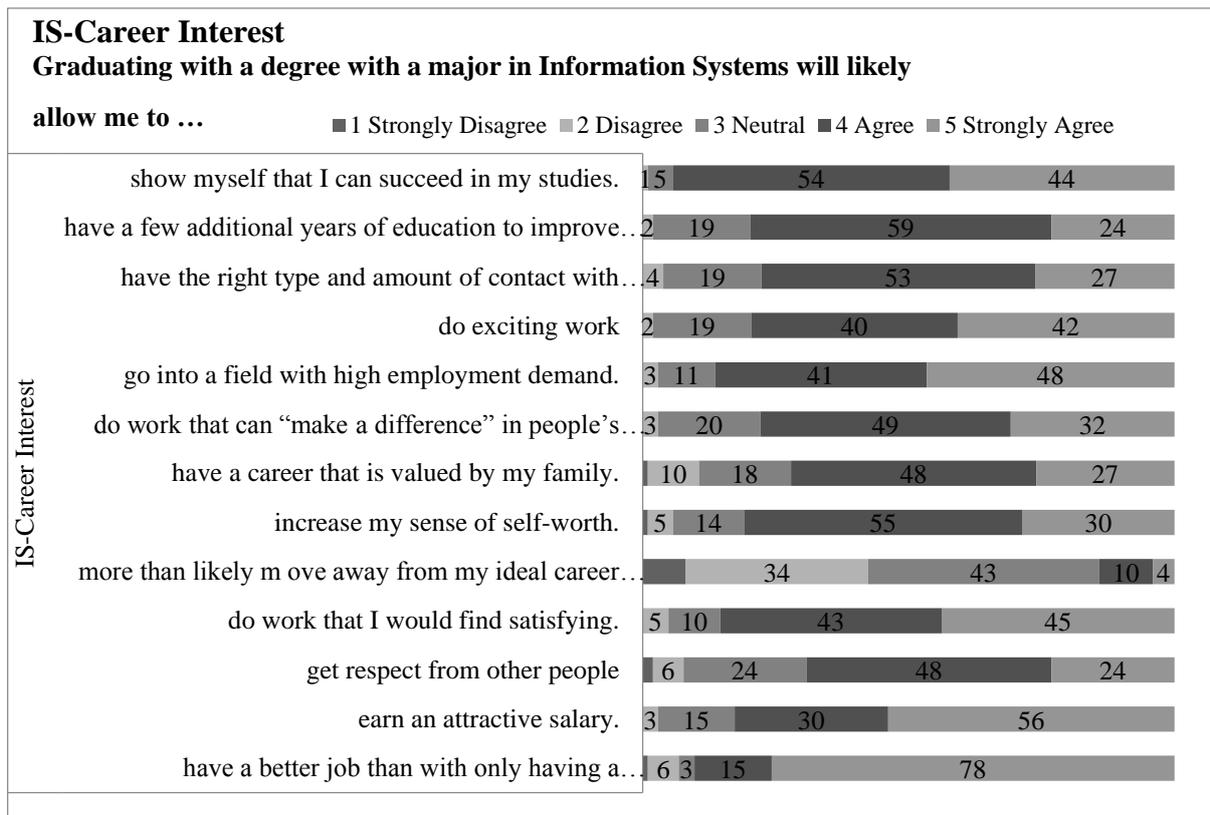
Respondents perceptions of having a "Better Job", "an Attractive Salary", "being in a field of High Demand", "Exciting Work" and "Showing themselves" that they can succeed are important aspects of IS - Career Interest. These seem to be important determinants for this individual efficacy factor. The response of strongly agree was the least in the Likert items of Get Respect (24) and Degree Education for Career (24). It is possible that these are not seen by the respondents as important and from their point-of-view not viewed as determinants of their career interest and ambitions. The IS – Career Interest factor is a sub-scale of the Individual Efficacy factor amongst the other factors (sub-scales) of IS – Activity Interest and IS – Confidence which are discussed next.

Figure 9: The Sub Scale: Information System (IS) – Activity Interest
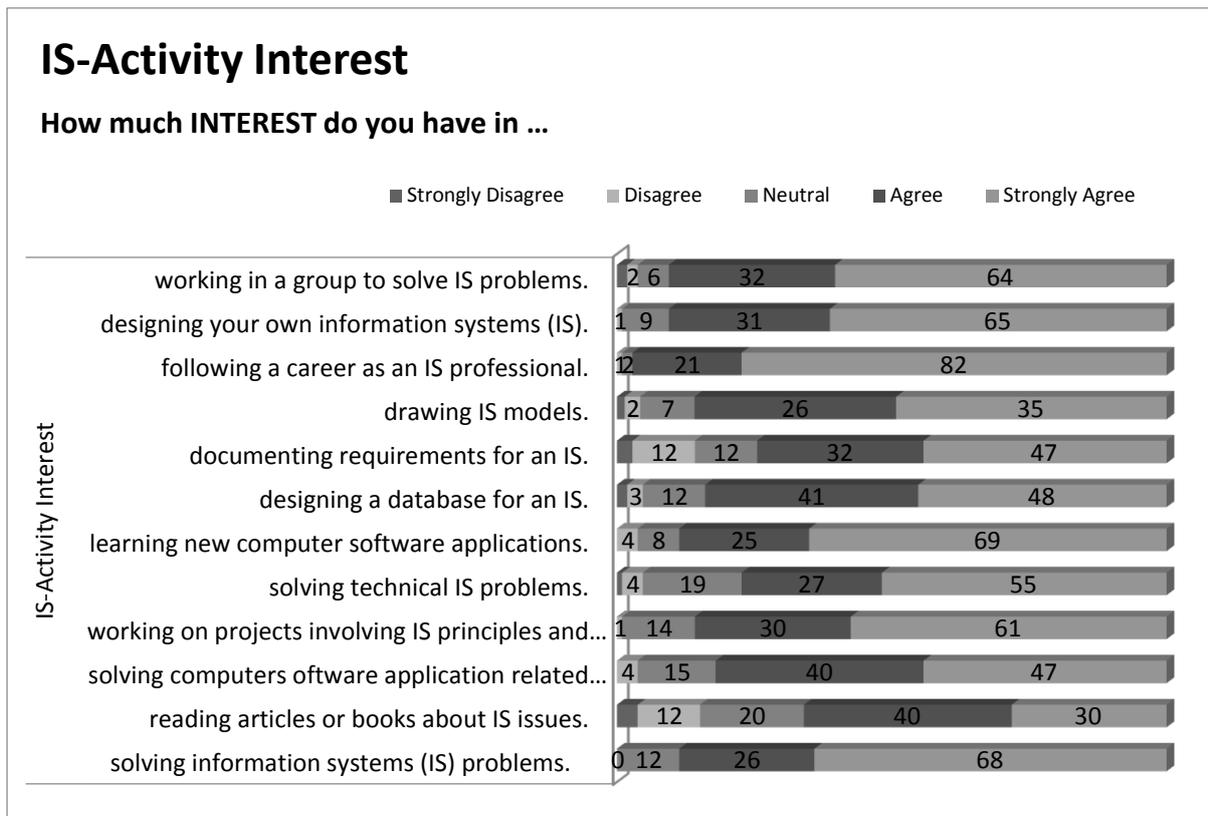
The results for individual efficacy factor of IS Activity Interest reflect that there is a high level of agreement between respondents overall for this individual efficacy factor (Figure 9). This result reflects that of the study by Brown et al. (2008) where activity-interest efficacy factors received very high responses. In the current study the results indicate quite clearly that most responses on the various scales show that respondents have indicated that they Agree (4) and Strongly Agree (5). Responses to the Likert items of "perceptions of solving IS problems", "having a professional IS career", "learning new apps", "designing their own IS apps" are important aspects of IS - Activity Interest and seem to be important determinants for this individual efficacy factor. However, respondents have much variability in their individual responses as reflected in the individual Likert items.

The responses of strongly agree were the least in the Likert items of "reading articles or books about IS" (30), "documenting IS requirements" (47) and "drawing IS models" (35). It is possible that these are not seen by the respondents as important and from their point-of-view are not seen as determinants as activity area of interest. The textbooks prescribed for the course, both the printed and the eBooks versions, are quite voluminous and the reading list is quite extensive. With such an extent of reading it is quite concerning that "…reading…" is perceived by respondents as not being an important activity

of interest. Laurillard (2013, p. 22) suggests that this is a factor that is quite complex and that it is worth exploring further. She explores the fact that learning is a constructed environment about the real world and that reading, about IS topics in this case, might be quite complex and not be instinctual but might need to be imparted via a guided approach. Academic learning is then a scientific version of the real world with little experience of the reality of the ISD field (Laurillard, 2013).

The IS – Activity Interest factor is a sub-scale of the Individual Efficacy factor amongst the other factors (sub-scales) of IS – Activity Interest and IS – Confidence (Brown et al., 2008). Although this variable is derived from the study by Brown et al. (2008), however, the results do not correspond. The study by Brown et al. (2008) was based on a career interest efficacy and was more generic and did not indicate specific behaviours. The domain specific factors of utilised in the current study which include drawing and reading of IS are domain specific content and might not seem important to the respondents. In future, such factors could be replaced with others that respondents would identify with thereby possibly improving the efficacy scores.

Figure 10: The Sub Scale: Information System (IS) – Confidence

IS - Confidence
Indicate the degree of CONFIDENCE that you have to …
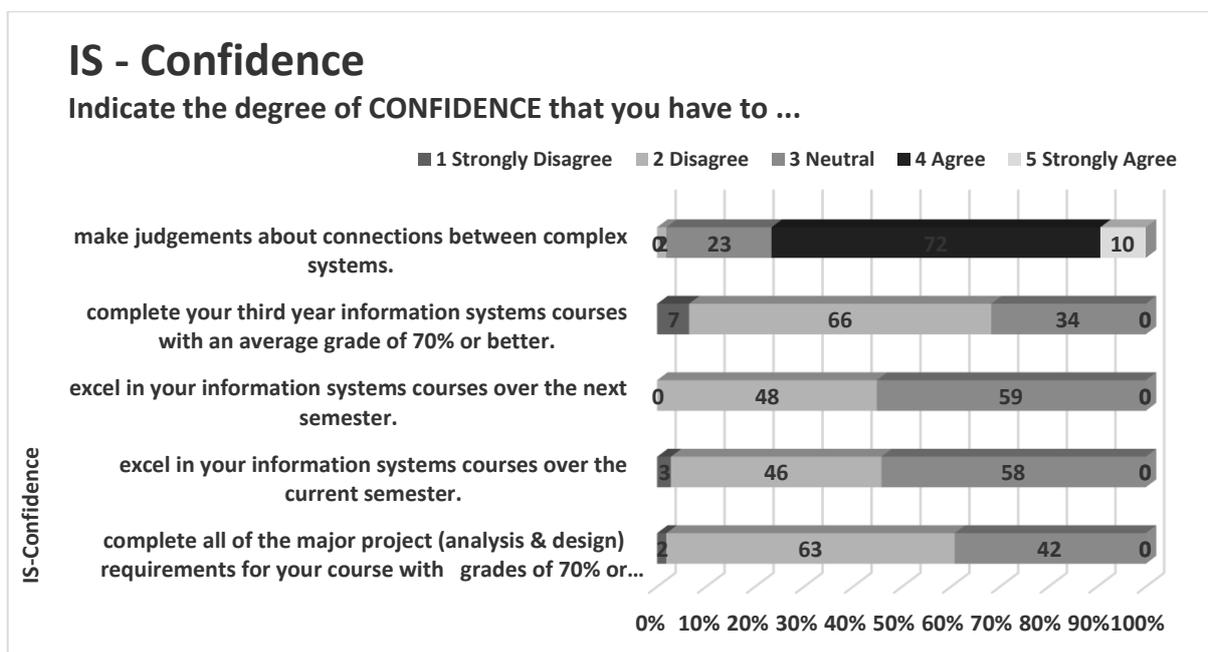
The results of the individual efficacy factor of IS – Confidence, as indicated in Figure 10, reflect that there are generally low and widely varying levels of agreement between respondents overall. It is not clear as to why respondents so have much variability in their responses as reflected in the individual Likert items. It is also not clear as to what can be interpreted as the general agreement across the entire sub-scale. Respondents' perceptions of "making judgements of connections in complex systems" are

the only Likert Item that reflects a high level of agreement from Agree (4), with 72, but not for the Strongly Agree (5), with 10. This seems to be an important determinant for this individual efficacy factor.

The response of strongly agree was not observed in the Likert Items of "completing a degree of 70% and above", "excelling in the current semester", "excelling in the next semester" and "completing the course with a 70% and above average". It is possible that these are not seen by the respondents as important and from their point-of-view not a determinant of their confidence decisions. It is also possible that they are not confident in their current course. It is quite concerning that respondents' confidence to achieve 70% and higher in the current course and the entire third-year level programme is not perceived to be achievable.

The IS Individual Efficacy factors included the factors (sub-scales) of IS – Career Interest, IS – Activity Interest and IS – Confidence are utilised for assessing efficacy factors on an individual level for examining the relationship to individual performance. The IS – Group efficacy factors will be subsequently discussed and are concerned with the measurement at the group level for their relationship to group performance.

4.3.2   Individual Efficacy Inferential Statistics (Section B)

An inferential analysis of the individual efficacy data was conducted to advise on the strength and significance of the relationships between the variables identified in the study. The study set out to identify relationships between the identified IS self-efficacy variables and student information system performance. Prior research indicated strong positive correlations of self-efficacy to student performance (Brown et al., 2008; Coffee & Rees, 2011). The current findings do not indicate a correspondingly strong relationship for the efficacy factors in general.

Table 4 : Individual Efficacy to Performance Correlation Matrix

Spearman's rho Correlations		(1)	(2)	(3)	(4)
(1) IS Performance	r	1.000	.403**	.090	-.142
	Sig. (2-	.	.004	.539	.330
(2) IS-Confidence (**HI-2**)	r	.403**	1.000	.045	.140
	Sig. (2-	.004	.	.757	.338
(3) IS-Career Interest (**HI-1**)	r	.090	.045	1.000	.321*
	Sig. (2-	.539	.757	.	.024
(4) IS-Activity (**HI-3**)	r	-.142	.140	.321*	1.000
	Sig. (2-	.330	338	.024	.

The IS Confidence factor is in line with the social cognitive theory by Brown et al. (2008). The Individual Efficacy to Performance correlation matrix indicates a positive correlation between IS-Confidence and Student Performance as reflected by H1-2. This identified and is as predicted by the theory and is consistent with the theory. It is expected that when IS-Confidence increases so will the related ISP, the coefficient of correlation, r, indicates a positive relationship. It is expected that the coefficient of correlation, r, should be at a value ranging from .500 to 1 (McClave, Benson, & Sincich, 2014). The reported value of .403, is fairly weak but represents a significant relationship at level .004, that is $P < 0.05$, hence we reject the null hypothesis in favour of the alternative, as indicated by HI-2 both in Table 5 which indicates the hypothesis conclusion and in Table 4 which indicates the individual efficacy correlations to performance. This suggests that there is a relationship between IS-Confidence and IS-Performance. The relationship between these two variables would be considered statistically significant.

Also determined by the findings is that there is no significant relationship worthy of reporting between IS-Career-Interest and Student Performance, as identified by HI-1, indicated in Table 4. It is expected that the coefficient of correlation, r, should be at a value ranging from .500 to 1 (McClave et al., 2014). The reported value of .090 is at the significance level of .539, that is $P > 0.05$, hence there is no relationship observed and we fail to reject the null hypothesis as indicated by HI-1 in Table 5 : Individual Hypothesis Conclusion.

Table 5 : Individual Hypothesis Conclusion

No	Hypothesis	Conclusion
HI-1	There is a linear relationship between IS-Career-Interest and IS Performance.	Fail to reject the Null Hypothesis in favour of the alternate. There is insufficient evidence to conclude that there is a linear relationship in the population between the predictor variable IS-Career-Interest and the response IS Performance.
HI-2	There is a linear relationship between IS-Confidence and IS Performance.	Reject the Null Hypothesis in favour of the alternate. There is sufficient evidence to conclude that there is a linear relationship in the population between the predictor variable IS-Confidence and the response IS Performance.
HI-3	There is a linear relationship between IS-Activity-Interest and IS Performance.	Fail to reject the Null Hypothesis in favour of the alternate. There is insufficient evidence to conclude that there is a linear relationship in the population between the predictor variable IS-Activity-Interest and the response IS Performance.

The last hypothesized relationship was also found not to be significant as identified by HI-, indicated in Table 4. In the research study by Brown et al. (2008) this variable was found to be a significant predictor of performance where the decision making processes that the individual would follow would lead to the execution of successful behaviour. It was expected that in this study that this result would be replicated, however, similar results were not achieved. In a correlation study, it is expected that the coefficient of correlation, r, should be at a value ranging from .500 to 1 (McClave et al., 2014). In this study, there is no observed relationship between IS-Activity-Interest and Student Performance, the reported r value of -.142, is less than zero and the significance level is at .330, that is $P > 0.05$, which has not shown any significant relationship, hence we fail to reject the null hypothesis as identified by HI-3 and indicated in Table 5.

4.4 Research Question 2 - What is the relationship between student group-behaviour and performance?

Research Question 2 (RQ2) is meant to establish the relationship of and the predicative capacity of group-behaviour for determining ISP in a third-year level IS academic course. It is expected that the results of such an analysis could provide insights into building academic programmes for IS teaching and learning and possibly some knowledge for the IS field interventions.

4.4.1 Group Behaviour Descriptive Statistics (Section A)

The descriptive statistics of the Group Behaviour factors will be discussed as follows (Tasa et al., 2007). Of the original population of 140, only 106 respondents participated in the survey, the target age group of respondents for this study was between the ages of 18 and 24. The demographics of the respondents per campus reflect that 13.11% and 86.89% were from the P (Pietermaritzburg) campus and the W (Westville) campuses, respectively and corresponds largely to the course enrolment ratio which is about (P:W) which is that of 30:70.

The Peer-rated Group Behaviour results as indicated in Figure 11 reflect that there is a high level of agreement between respondents overall for this group efficacy factor. The responses do indicate that there is much variability in their individual responses reflected in the individual Likert items, however, it is quite clear that there are stronger responses on the scales from Agree (4) and Strongly Agree (5).

The perceptions of the behaviour of respondents in the current study of performing information sharing, same gender cooperation, opposite gender cooperation, enabling group level discussion, accepting group decisions and prior to meeting information sharing behaviours are important aspects of IS - Peer Rated Group Behaviour (Hsu et al., 2016; Liu et al., 2015). These seem to be important determinants, contributors, for this group efficacy factor (Klocke, 2007; Trochim, 2006).

Figure 11: The Sub Scale: Information System (IS) – Peer Rated Group Behaviour

IS-Peer Rated Group Behaviour

please indicate the frequency with which OTHER members of the group have displayed the following BEHAVIOURS...

Legend: ■ Strongly Disagree ■ Disagree ■ Neutral ■ Agree ■ Strongly Agree

IS-Peer Rated Group Behaviour	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
attending group meetings, but do not truly contributing.	17	25	25	34	2
co-operating with fellow group members of the opposite…	4	5 17		50	30
co-operating with fellow group members of the same…	2 11	17		46	30
summarizing the discussions and decisions made by the…	7	10	38	42	9
forced to accept group decisions.	12	27	37	29	1
willingly accepting group decisions, even if they are…	1 6	29		52	18
sharing information prior to group meetings.	1 14	28		43	20
sharing of information within the group.	0 4	19		56	27
assuming leadership.	5	15	36	36	14
trying to calm down group members that are in conflict.	8	11	35	38	14
addressing conflict, immediately by raising it for…	8	15	41	33	9
steering group members towards on-topic conversations.	0 8	41		47	10
ignoring or discouraging off-topic conversation.	6	18	49	27	6
drawing group members into discussions that are…	0 3	30		53	20
participating in developing strategies to achieve group…	0 5	17		57	27
taking (accepting) the group's ideas and developing…	0 4	22		66	14
taking steps to ensure everyone participates in group…	2 8	33		53	10
setting time deadlines for achieving goals.	1 6	21		61	17

The IS Peer-rated responses as indicated in Figure 11, also reflect that the Likert item response for strongly agree (5) was the least in the Likert items of discouraging off-topic conversations (6), forced to accept group decisions (1) and attending group meetings but not truly contributing (2). It is possible that these are not seen by the respondents as important and from their point-of-view not a determinant of their group behaviour. These are, however, important for making sure that the respondents in general are not forced to make decisions. The IS – Peer Rated Group Behaviour factor is a sub-scale of the Group Efficacy factor separate from the other factor (sub-scale) IS – Group Behaviour which will be discussed next (Kim & Shin, 2015; Klocke, 2007; Tasa et al., 2007).

The results of the IS–Group Behaviour factor reflects that there is a high level of agreement between respondents overall for this group efficacy factor. IS–Group Behaviour responses show much variability in the individual responses for the various Likert items, however, it is quite clear that there are stronger

responses on the scales from Agree (4) and Strongly Agree (5). Respondent's perceptions of IS-Peer Rated Group Behaviour are important aspects of Group efficacy and these seem to be important determinants for this group efficacy factor.

Figure 12: The Sub Scale: Information System (IS) – Group Behaviour

IS - Group Behaviour
Please indicate the extent to which YOU personally feel capable of exhibiting the following BEHAVIOURS.
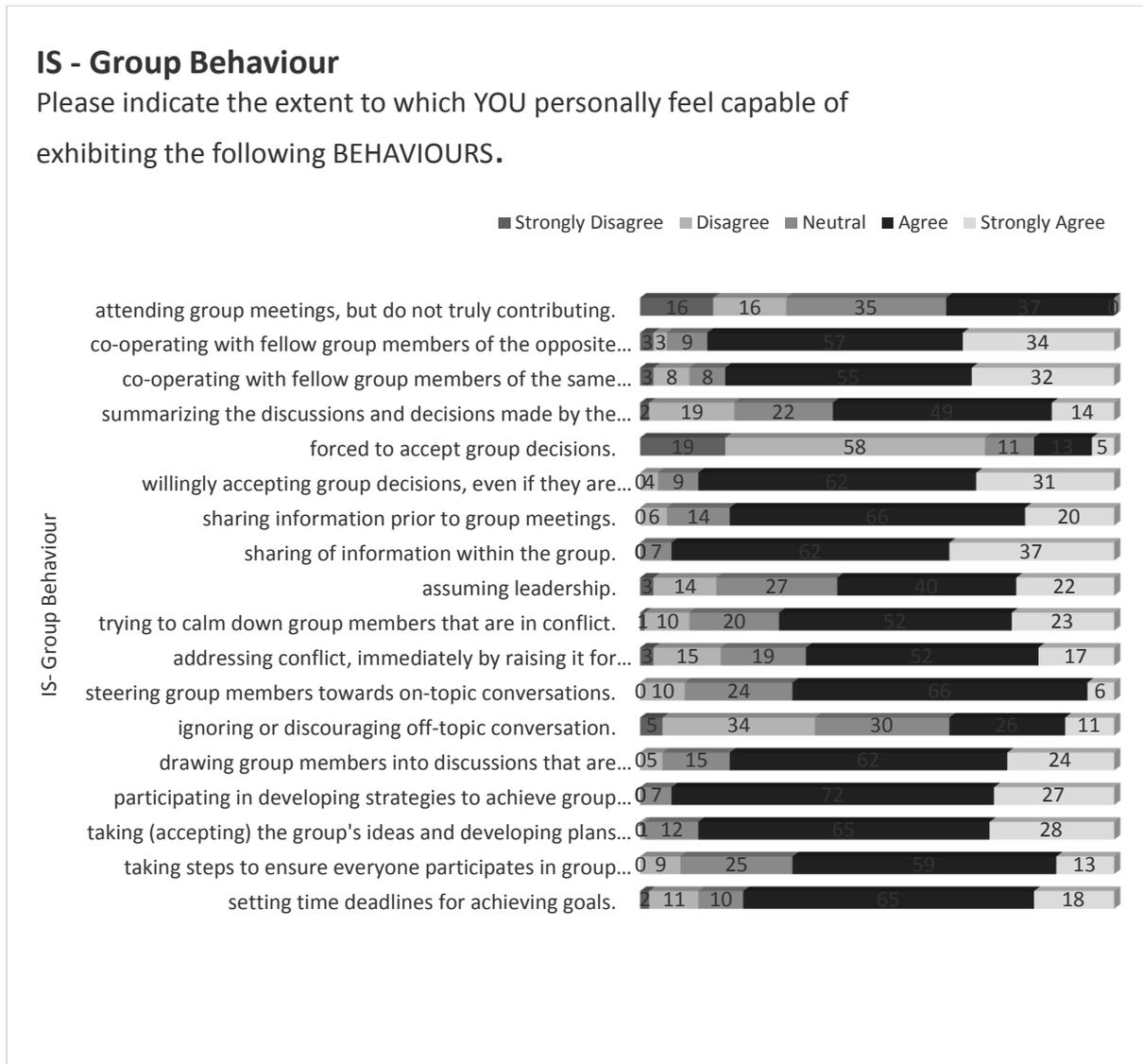
As indicated in Figure 12, the IS-Group Behaviour responses of strongly agree was the least in the Likert items of "steering group members to on-topic conversations". It is possible that these are not seen by the respondents as important and from their point-of-view and hence not a determinant of their group behaviour. These are, however, important for making sure that the respondents in general are not "forced to make decisions". Respondents in general seem very positive about being involved in group-work task approaches and they do seem to contribute to group activities that could lead to success, for

example "steering group members towards the topic of discussion". The IS – Group Behaviour factor is a sub-scale of the Group Efficacy factor and is important in understand ISD group behaviour. According Fei (2011, p. 890) collaborative information sharing behaviour differs from individual information behaviour with respect to how individuals interact with each other where are specific triggers for transitioning from individual to collaborative information sharing behaviour. The fact that these respondents feel that they do "strongly agree" with collaborative information sharing can promote innovation and organisational core competencies (Fei, 2011; Liu et al., 2015).

4.4.2   Group Behaviour Inferential Statistics (Section B)

An inferential analysis of the group behaviour data was conducted to inform about the strength and significance of the relationships between the variables identified in the study (McClave et al., 2014). The study set out to identify relationships between the identified IS group efficacy variables and student information system performance. Prior research indicated strong positive correlations of group efficacy / behaviour to student performance (Brown et al., 2008; Coffee & Rees, 2011; Lam & Schaubroeck, 2009; Stajkovic et al., 2009). The current findings, however, do not indicate a correspondingly strong relationship for the efficacy factors in general.

The IS Group Behaviour Factors are not consistent with the social cognitive theory (Bandura, 1977; Brown et al., 2008; Li et al., 2013). A positive correlation between (IS) – Group Behaviour (HG-1) and Student Performance has been identified by HG-1, as indicated in Table 6. However, it is not in line with the theory and is against the predicated strong association (Li et al., 2013). There is very weak association of Group Behaviour to ISP although the coefficient of correlation, r, indicates a negative relationship. It is expected that the coefficient of correlation, r, should be at a value ranging from .500 to 1. The reported value of -.002, is very weak and represents no significant relationship at level .981, that is $P > 0.05$, hence the conclusion is that there is no relationship observed and we fail to reject the null hypothesis as identified by HG-1, as indicated in Table 7 : Group Behaviour Hypothesis Conclusion and Table 4 : Individual Efficacy to Performance Correlation Matrix. The relationship between these two variables would not be considered statistically significant.

Table 6 : Group Behaviour to Performance Correlation Matrix

Spearman's rho Correlations		(1)	(2)	(3)
(1) IS Performance	r	1.000	-.002	.041
	Sig. (2-tailed)	.	.981	.673
(2) (IS) – Group Behaviour (HG-1)	r	-.002	1.000	.430
	Sig. (2-tailed)	.981	.	.
(3) (IS) – Peer-rated Group Behaviour (HG-2)	r	.041	.430	1.000
	Sig. (2-tailed)	.673	.	.

Also determined by the findings is that there is no significant relationship worthy of reporting between Peer-rated Group Behaviour (HG-2) and Student Performance as identified by HG-2 as indicated in Table 6 : Group Behaviour to Performance Correlation Matrix (Stajkovic et al., 2009). In a correlation study, it is expected that the coefficient of correlation, r, should be at a value ranging from .500 to 1 (McClave et al., 2014). For this study, the reported value of .041 is at the significance level of .673 that is $P > 0.05$, hence the conclusion is that there is no relationship observed and we fail to reject the null hypothesis as identified by HG-2, indicated in Table 7. The relationship between these two variables would not be considered statistically significant.

Table 7 : Group Behaviour Hypothesis Conclusion

No	Hypothesis	Conclusion
HG-1	There is no linear relationship between Group Behaviour (HG-1) and IS Performance.	Fail to reject the Null Hypothesis in favour of the alternate. There is insufficient evidence to conclude that there is a linear relationship in the population between the predictor variable Group Behaviour and the response IS Performance.
HG-2	There is no linear relationship between Peer-rated Group Behaviour (HG-2) and IS Performance.	Fail to reject the Null Hypothesis in favour of the alternate. There is insufficient evidence to conclude that there is a linear relationship in the population between the predictor variable Peer-rated Group Behaviour and the response IS Performance.

4.5 Research Question 3 - What is the relationship between student group-efficacy and performance?

Research Question 3 (RQ3) is meant to establish the relationship of and the predicative capacity of group-efficacy for determining ISP in a third-year IS academic course. It is expected that the results of such an analysis could provide insights into building academic programmes for IS teaching and learning and possibly some knowledge for the IS field interventions (Li et al., 2013; Stajkovic et al., 2009).

4.5.1 Group Efficacy Descriptive Statistics (Section A)

As indicated in Table 8, the responses of the group efficacy descriptive statistics, shows that the number of respondents per group varies from 4 up until 7 group members which almost the full complement of each group as the group were defined in the course during the group allocation stage of the course. Small group research indicates that small group size is important for group efficacy and communication as well (Seijts et al., 2000). Soboroff (2012) suggests that smaller group sizes are more effective for group cohesion and trust; and help make group coordination less complex. The group sizes in the current study are ideal in terms of the theory (Soboroff, 2012) as the size increases so will the level of trust, cohesion, commitment and the sense of responsibility decrease.

Table 8 : Group Efficacy Descriptive

Group	Group Efficacy Mean	Performance Mean	SD	N
1	74	64	11	6
2	73	65	5	5
3	67	58	12	5
4	76	61	8	6
5	65	68	11	5
6	78	65	6	7
7	75	68	7	5
8	72	60	12	5
9	75	64	5	7
10	72	65	11	5
11	77	68	7	4
12	67	63	17	3
13	79	71	6	5
14	73	62	8	5
15	75	68	12	4
16	73	64	8	6
17	75	67	9	5
18	75	62	11	5
19	80	70	0	2
20	70	65	5	6
21	71	62	8	5

There are 26 groups in the IS course; however, responses were received from only 21 groups. It is not clear as to why the other groups and group members did not complete the survey, however, it would be important to understand why in future research. The sample was fairly reflective of the number of members per group and the number of groups in the course with the average number of group members being 5.05 members (SD = 3.53) as indicated in Table 8 which showed the group efficacy descriptive analyses.

The group-efficacy-to-performance results, as indicated in Figure 13, shows the group efficacy scores above the group performance scores. The results reflect that the efficacy of the group is consistently higher than the performance of the related group which is in line with the theory (Stajkovic et al., 2009). Within the current study, as conversely indicated in Figure 13, the results for Group 5 (Group Efficacy of 65% and Performance Mean of 68%) the group efficacy was lower than the group performance.

Figure 13 : Group Efficacy to Group Performance Mean

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
Group Efficacy Mean	74	73	67	76	65	78	75	72	75	72	77	67	79	73	75	73	75	75	80	70	71
Performance Mean	64	65	58	61	68	65	68	60	64	65	68	63	71	62	68	64	67	62	70	65	62
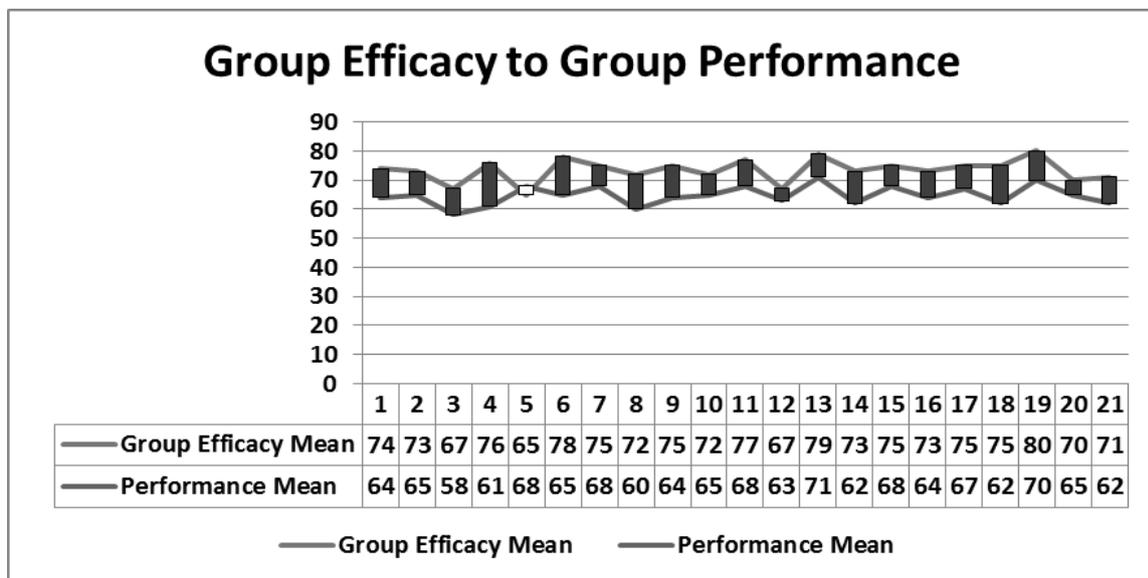
In the study by Taylor (2014) self-reported performance scores were used, however, in the current study the performance scores were based on extracts from the UKZN student records system. Besides the source of the performance data it would be very valuable to identify why this one group has an efficacy score that is lower than that of their performance score and why group scores in generally so closely matched to the efficacy scores.

4.5.2 Group Efficacy Inferential Statistics (Section B)

The IS Efficacy Factors are in line with the social cognitive theory (Bandura, 2000). A strong positive correlation between (IS) – Group Efficacy (HGE-1) and Student Performance as identified by HGE-1 indicated in Table 9. The Group Efficacy to Performance matrix has identified support for the expected predicated strong association of group efficacy to performance.

Table 9 : Group Efficacy to Performance Correlation Matrix

Spearman's rho Correlations		(1)	(2)
(1) (IS) - Group Performance	r	1.000	.453
	Sig. (2-tailed)	.	.040
(2) (IS) – Group Efficacy (HGE-1)	r	.453	1.000
	Sig. (2-tailed)	.040	.

In a correlation study, it is expected that the coefficient of correlation, r, should be at a value ranging from .500 to 1 (McClave et al., 2014). For this study, there is very strong association of Group Efficacy to ISP as the coefficient of correlation, r, indicates a positive relationship. The reported value of 0.453, is not very strong but represents a significant relationship at the .040 level, that is $P < 0.05$. Hence the conclusion is that there is a relationship observed and we reject the null hypothesis, as identified by HGE-1 indicated Table 10 and which also supports the individual efficacy to performance results as indicated in Table 4. The relationship between these two group variables of group efficacy and group performance would be considered statistically significant.

Table 10 : Group Efficacy Hypothesis Conclusion

No	Hypothesis	Conclusion
HGE-1	There is a linear relationship between Group Efficacy (HGE-1) and IS Group Performance.	Reject the Null Hypothesis in favour of the alternate. There is sufficient evidence to conclude that there is a linear relationship in the population between the predictor variable Group Efficacy and the response variable IS Performance.

According to HGS0 – Null Hypothesis this suggests that there is no significant difference between the performance scores of efficacy groups of low, medium and high efficacy.

4.6 Research Question 4 – In what way does the performance differ between efficacy level groups?

Research Question 4 (RQ4) is meant to establish the relationship of and the predicative capacity of efficacy for determining ISP in a third-year IS academic course. This is expected to be achieved by comparing the performance of groups of different efficacy levels. It is expected that the results of such an analysis could provide insights into building academic programmes for IS teaching and learning and possibly some knowledge for the IS field interventions.

4.6.1 Efficacy Group Performance Difference Inferential Statistics (Section B)

After sorting the efficacy scores of respondents from lowest to highest, three efficacy groups were created and these were used as the source for this analysis. The Kruskal-Wallis H test or the "one-way ANOVA on ranks", a rank-based nonparametric test was applied to this study to determine if there were statistically significant differences between groups of an independent variable (McClave et al., 2014). Applied to this study, the Kruskal-Wallis H test, showed that there was a statically significant difference in the performance scores between the different efficacy groups, $X2(2) = 8.774$, $p = 0.012$, with a mean rank score performance score of 42.06 for Group 1 (Low Efficacy), 63.56 for Group 2 (Medium Efficacy) and 53.39 for Group 3 (High Efficacy).

Number of groups that were analysed was three (3). The Median of Group 1 is 62.000000, the Median of Group 2 is 67.000000 and the Median of Group 3 is 64.000000. The W statistic is 2.145122 with the corresponding p-value is 0.121839 and the critical value W statistic is 3.077309. The result is that we accept the Null Hypothesis that variances are equal for all groups. This suggests that the performance scores for each efficacy group are homogenous in nature, hence the results are statistically significant. The scores do not increase in a corresponding pattern, which indicates they do not correlate to the level of the associated efficacy group level (see the results for group 3). It would be expected that the lower efficacy group would have a lower score and the increasingly higher group efficacy would result in a correlated performance score (Bless, Higson-Smith, & Kagee, 2006). Hence, group 3 should have the highest score. This is not in line with the theory which suggested a strong correlation of efficacy to performance (Stajkovic et al., 2009).

4.7 Summary

The results of the descriptive analyses show that the population of this study consider efficacy both at the individual and the group level to be important factors and the answers provided in the survey questions had valid and important information insights presented. The knowledge gained from

understanding the Group behaviour factors was very useful. The inferential analysis results, however, show that efficacy scores are quite high in some cases and quite low in others. Individual efficacy, group behaviour and group efficacy results show that both are not significant determinants of ISP. Group behaviour as per student's own experience and that of the student's perceptions of other students' behaviour have not shown any strong relationships to ISP. The reasons for such could be that there are some mediating variables that might need to be analysed further as well the sample size be expanded to include students from other universities and colleges of higher education offering similar degrees. The individual and group efficacy scales could be adjusted by selected only the scales which show the higher efficacy scores as well as new variables identified (Hsu et al., 2016) for the next application. These lower scores could be negatively impacting the average calculation across each scale and having too many questions could also negatively impact the accurate and valid completion of the Likert item for each response. Fewer Likert items and more well responded to ones could prevent tedium in completing the scale as a whole. Liu et al. (2015), suggest a focus on the factors that lead not only to a generic type of performance by a focus on factors which lead to innovative performance. Kim and Shin (2015) purported that collective efficacy is a mediator in the relationship to team creativity and other group variables. This mediator relationship would possibly need to be investigated further (Trochim, 2006).

The performance score for the current study was determined based on a generic and atomic performance score, as indicated in Table 2. This is a single course mark with no separation of marks based on the different types of performance. Hsu et al. (2016), for example, suggested the expansion of the performance measure to consider factors of different types of performance to provide insights in the relationship of individual and efficacy factors. Hsu et al. (2016) found that expertise coordination behaviour correlated quite strongly to success in ISD. Other mediating factors like group trust in building efficacy in the study by Lee, Stajkovic, and Sergent (2016) could be important to explore. Group trust in this study could have provided insights into the group behaviour of the study groups and why the possibly did not have strong group efficacy scores. Nevertheless, the knowledge gained is vital to improving group teaching and learning in IS and can contribute significantly to IS field interventions. In conclusion, the last chapter discusses this study's results, presents recommendations; highlights the study limitations and future direction and draws conclusions.

CHAPTER 5: RECOMMENDATIONS AND CONCLUSIONS

This chapter presents conclusion and recommendations based on the findings in Chapter 4.

5.1 Recommendations

The objectives of this study were, firstly, to examine impact of individual efficacy on ISP teaching and learning and secondly, to examine impact of group behaviour on ISP teaching and learning and lastly, to examine impact of group efficacy on ISP teaching and learning. To achieve the first, second and third objectives, a descriptive analysis and inferential analysis was conducted to gather primary data and to validate the relationships hypothesised in the study. An online survey was utilised to gather data from 140 students from the University of KwaZulu-Natal in South Africa. Data were analysed to address the research objectives, the following questions are answered.

5.1.1   Research Question 1 - What is the relationship between student self-efficacy and performance (RQ1)?

The results showed that not all social cognitive factors accurately predict ISD performance, but they do provide some insights that can lead to performance improvements. This study has revealed that there is no significant relationship between self-efficacy and performance in the academic context. IS-Career-Interest and IS-Activity-Interest will need to be further examined to establish what, if any, are the intervening or mediating variables in their relationship to performance. The variable of IS-Confidence, however, is significant and has been established as a predictor of individual ISD performance. The confidence levels of many respondents were, however, quite low.

Academics or course designers should consider activities that help build student confidence levels. Students who have already graduated with an IS degree and who are working in the field to act as mentors to current students to help to reinforce the ideas that success is possible. As this is an area of weakness, confidence building exercises would go a long way to assist students. Knowledge gained from the current study could be applied to IS course curriculum design practices with a focus on enhancing opportunities for increasing and maintaining learner IS-Confidence levels. The study has highlighted the importance of IS-Confidence as an area worthy of further investigation to improve a student's potential to succeed and build the necessary skills and capacity towards a successful career in ISD. This is a significant factor that can aid academics in their role of developing IS students. Hence, the objective of this study has hence been partially achieved.

Wan and Rucker (2013), purport that higher confidence levels promote the strength that individuals feel in their ability to perform various actions. This then removes the doubt or hindrances that may negatively influence them. Courses should be designed to encourage confidence building to maintain the relationship of IS-Confidence to performance. Activities like pair programming where student's work together to solve problems and online quizzes could help to provide more practice and build confidence. The strength of the relationship between IS-confidence and performance indicates that considerable effort is required into developing exercises that build confidence for IS individuals. This confidence can only be maintained by providing people with a nurturing environment to sustain high self-efficacy for continued performance success. Also, where tasks are complex in nature, attention needs to be given to enable support of both the physical and emotional factors of managing that task. Providing constructive feedback on performance of the various activities should be conducted in preparation for successive tasks. Courses should be designed to encourage confidence building to maintain the relationship of IS-Confidence to efficacy. Activities where students work together to solve problems and online quizzes could help to provide more practice and build confidence.

In situations where students are found to have low individual efficacy together with correspondingly low performance, Academics should consider when implementing IS courses they should investigate issues on a case-by-case basis and intervene. It could be that students have some problems related to areas of concern (Brown, Lent, Telander, & Tramayne, 2011; Brown et al., 2008). In this case, it is possible that they are not matched for a career in IS or that they need an intervention or that they need to be investigated for possible performance barriers. A possible solution to some of these problems could be that where students who have already graduated and progressed to the field could act as mentors to students to help to reinforce the ideas that success is conceivable and achievable which could thereby promote confidence building.

5.1.2 Research Question 2 - What is the relationship between student group-behaviour and performance?

The results showed that respondents in this study have positively indicated that they would work in group and participate effectively. Students also indicated that they found fellow group members to be cooperative, to have no problems cooperating with students of different genders and be interested in sharing information with the group. They seem, however, not to be responding well to manging conflict within the group and discouraging off-topic discussions.

Therefore, when implementing interventions in group-based project approaches academics and industry managers should investigate the group behaviour of the project group and use the findings to design an appropriate intervention. Strong group behaviour in an IS development environment is essential to

success of the group, will help build group character and lead to solutions to IS field projects. Conflict management strategies and group coordination strategies could help the groups to focus their efforts on group-work "agenda" topics and guide them to staying on topic.

5.1.3 Research Question 3 - What is the relationship between student group-efficacy and performance?

The results showed that there is very strong association of Group Efficacy to ISP and that the relationship between these two variables is considered statistically significant (Kim & Shin, 2015). Respondents in this study have positively indicated that they would work in group and participate effectively.

Therefore, when implementing interventions in group-based project approaches academics and industry managers should investigate the group efficacy of the project group and use the findings to design an appropriate intervention. These should areas of group communication, coordination, conflict management and other harmonizing strategies. The group should be monitored for signs of conflict and actively engage the group to help early in the project.

5.1.4 Research Question 4 – In what way does the performance differ between efficacy level groups?

The results showed that there was homogeneity within the groups (low-efficacy [group 1], medium-efficacy [group 2] and high-efficacy groups [group 3]) which indicates that the performance of members of each of the efficacy groups was similar, 42.06, 63.56 and 53.39. This however does not show an increasing trend in the performance scores of the different groups. From group 1 to group 2, there is an increase in performance, however, the performance score for group 3 is a value between the first two groups, and therefore an intervention in this area is suggested. As per the theory the efficacy level should correlate with the performance level, hence this is a possible area of concern.

When implementing group-work approaches academics, course designers and industry managers should monitor the group efficacy levels of each group and check the correlation to the group performance and compare that to other groups. Strategies to monitor and build group efficacy should help the different groups maintain their related performance scores. It could be possible to perform this

check in reverse when the students are divided into performance groups and then monitor the group efficacy for opportunities of improvement (van Dolen et al., 2006).

5.2 Future research and conclusion

This section will identify aspects of future research to be undertaking for its relationship to performance improvements. First, this study can be conducted at other similar academic institutions to strengthen the theory, gain further insights and possibly help alleviate and / or solve problems. This would possibly lead to closing the gap on IS project failure in both academic and IS industrial software development projects. Second, the final performance (course) mark can be divided into multiple parts for further but separate analysis. For example, the separation of the performance marks into their component parts of non-cognitive, cognitive and affective parts relating to the associated tasks could allow the correlation of efficacy factors to each part (factor) individually. This new set of variables could produce quite interesting relationships worthy of further examination particularly for discovering new intervening and mediating variables. Kim and Shin (2015), suggest examining relationships between group efficacy and team creativity. Team creativity can be determined by adding a separate creativity component to the course as a whole or for the individual deliverables for determining performance marks. Here, when the academic is assessing the group outputs a mark can be assigned to this category. A study examining the relationship of team creativity to team performance could produce very valuable insights and contributions to the body of knowledge on group performance.

Third, the final performance (course) mark, the main dependant variable, could be conceptualised as three different components, namely, Prior Performance, Current Performance and Expected Performance. Prior performance would be the group mean mark obtained prior to the subjects undertaking the current course in the present study. This can include the matriculation (grade 12) mean score and / or any combination of university marks to constitute a mean, either as a generic prior performance mean or a mean for the subjects that constitute the domain under study which can be referred to as a domain prior performance mean. Fourth, using a domain (IS major) prior performance mean is as a result of the fact that IS is a specialization area and from a granular perspective it might be important to focus on the impact of this specific domain, while ignoring others which could possibly cloud the factors under investigation. The clouding factors could be the other subjects in the general degree programme. The source of these marks would be the student records department and the academic department.

Fifth, as per, Gladstein (1984), factors concerning the nature of the task and the associated variance of group processes and interaction on group performance is of great importance, however, this was not

explicitly examined in this study. Gladstein (1984) suggested that "those process variables that increase information-processing capacity will be more predictive of group effectiveness". This is certainly a consideration for further research to measure its relationship to group performance. Sixth, these studies focussed on the view that success measured by ability is not the only means to measure and predict performance. Insights gained in this study would need to be taken forward to establish how non-ability factors can be combined with ability factors to create a formula for success. Future research is required to test the following hypothesis of Performance Success = Individual Efficacy + Group Efficacy + Specific Group Behaviour Factors, where very specific group behaviour factors could be examined (Bučko & Drozdová, 2014; Kim & Shin, 2015; Li et al., 2013).

Seventh, further research is required to look at the concept of self-esteem for its relationship to performance and self-efficacy. Self-esteem is a different variable from self-efficacy but could be an intervening variable as the variation in self-esteem could impact the relationship of self-efficacy to performance (Bandura, 1989b). This is worthy of further research. Eighth, groups must have benchmarks that they work towards and against for improvement of the work that they must produce. Again, further research exploring from an open-ended and qualitative perspective what the various groups perceive as benchmarks for which they can compare their knowledge, ideas and strategies, etc. Incorporating an evaluation of the processes involved in how they identify, build, set these benchmarks could be further researched for the relationship to performance (Bandura, 1989b).

Ninth, as purported by Hackman (2002a) and (Hsu et al., 2016), there are so many factors that could impact team performance and it is not easy to make all team work effective for every process, however, it is worth investigating (Lee et al., 2016). Hence further research is required here, particularly for supporting teamwork in the factors of the reward system, the information system, and the educational system for the relationship to performance (Hsu et al., 2016; Lee et al., 2016). In general, when using group-work approaches the mode of communication for completing assigned work-tasks should be monitored and considered (Kim & Shin, 2015). The fact that, in this study, most students prefer a mixed mode of engagement has implications for the particular group. An assessment of the groups should guide feedback and the implementation of appropriate support and intervention strategies. The identified mode of teaching and learning that students are comfortable with spending time both in online and face-to-face engagement when completing their work tasks is the preferred approach to keeping the group effective and maintaining the capacity to deliver for the project (Kim & Shin, 2015).

Future research could include research designs, which include both quantitative and qualitative methods, which is a mixed method design that is effective for understanding complex educational questions such as teaching and learning in ISD. This approach to inquiry could add value and provide more useful insights into strengthening the individual and group efficacy constructs. Cecez-

Kecmanovic et al. (2014), suggest that the researcher should focus on the sense-making, interpretive and political processes of IS projects and assessments to reveal narratives from the IS "äctors". Hummel et al. (2015) suggested examining the communication strategies for Agile versus traditional teams and the impact on team success. Together these factors could produce valuable insights.

Computer science students and commerce students are following separate degrees programme and are identified as different sub-disciplines within that broad of ISD (Alexander, Lotriet, & Pietersey, 2014). For this reason, they should possibly be researched separately with regards to the ISD efficacy phenomenon (Alexander et al., 2014). One reason for such a distinction could be that computer science students have a more technical perspective whereas the commerce students have a more business perspective (Alexander et al., 2014). Further towards such a study, a qualitative analysis can be used to establish additional factors affecting performance and could improve the efficacy research instrument based on the findings. Future studies could use a similar quantitative research approach to target a larger population and possibly include other universities, universities of technology of both public higher institutions and private colleges. A longitudinal study is advised to enhance the predictive value of IS-Confidence as well as try to strengthen the other variables identified from the current study.

In conclusion, knowledge gained from the current study could be applied to the IS course curriculum design practices with a focus on enhancing opportunities for increasing and maintaining learner efficacy levels. Hence, by developing stronger efficacy students, industry ready students will enter the workforce and help alleviate the problem of low ISD project success.

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APPENDIX A: ETHICAL CLEARANCE

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03 June 2012

Mr Dean A Achmad (201508255)
School of Management, IT & Governance

Dear Mr Achmad

Protocol reference number: HSS/0259/012M
Project title: Information Systems Student Project Performance: A study of individual and group social cognitive predictors

In response to your application dated 08 May 2012, the Humanities & Social Sciences Research Ethics Committee has considered the abovementioned application and the protocol has been granted **FULL APPROVAL**.

Any alteration/s to the approved research protocol i.e. Questionnaire/Interview Schedule, Informed Consent Form, Title of the Project, Location of the Study, Research Approach and Methods must be reviewed and approved through the amendment /modification prior to its implementation. In case you have further queries, please quote the above reference number. Please note: Research data should be securely stored in the school/department for a period of 5 years.

I take this opportunity of wishing you everything of the best with your study.

Yours faithfully

Professor Steven Collings (Chair)
Humanities & Social Science Research Ethics Committee

cc Supervisor: Mr Ashley Marimuthu
cc Academic Leader: Professor K Govender
cc Ms Angela Pearce

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