The influence of power on the success of systems development methodologies

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ABSTRACT

Problem statement: There seem to be perceptual incongruence between systems development managers and developers. Research shows that while managers are more positive towards systems development methodologies, developers on the other hand seem to resist and not to use systems development methodologies in their entirety but instead adapt, tailor, modify and change them depending on the project at hand (contingent use). Systems development managers can exert power through a variety of influence bases. However, these power influences may be perceived differently by developers. While some might feel constrained, others might actually feel liberated by the existence of the same influence base.

Main findings: IS managers are using systems development methodologies to gain control over team members. However, there was no clear perception on whether systems development methodologies were enslaving systems developers. This was indicated by the majority of the respondents neither agreeing nor disagreeing to that effect. The research showed that most organisations are adapting the use of systems development methodologies on a project to project basis, which is referred to as the contingent use of systems development methodologies.

Research method followed: The positivistic research paradigm was used as it allowed the researcher to find out patterns and regularities between power, systems development methodologies' use and success. A survey was conducted and a questionnaire was used for data collection purposes. Questionnaire data was analysed using IBM SPSS Statistics Version 21, Release 20.0.0 software package tools.

Principal conclusion: Power is interpreted in terms of the type of power that can be exercised by IT professionals specifically IS developers and their respective managers at the workplace. The roles assumed and the different power types that may be exercised in organisations provide a link as to who has the final say when it comes to the use and success rate of systems development methodologies. The contingent use of systems development methodologies provides a form of "freedom" to systems developers. Based on the research findings, the research proposes an answer to the question – are systems development methodologies enslaving systems developers and empowering IS managers?

Keywords: Power, systems development methodology, systems developers, information systems managers, contingent use of systems development methodologies.

SAMEVATTING

Daarstelling van Navorsingsprobleem: Dit wil voorkom asof daar `n perseptuele inkongruensie bestaan betreffende die konsepte van sisteem ontwikkelingsbestuurders en die van ontwikkelaars. Navorsing toon dat, hoewel bestuurders `n meer positiewe houding inneem teenoor sistemiese ontwikkelingsmetodologieë, ontwikkelaars weerstandig daarteenoor optree en selde of ooit sistemiese ontwikkelingsmetodologieë as entiteite aanwend, maar sodanige metodes aanpas, verander en modifiseer, afhangend van die projek wat op daardie stadium aangepak is. Hierdie bekragtigingsverskille mag egter deur verskillende ontwikkelaars verskillend waargeneem word. Sisteem ontwikkelingsbestuurders word bekragtig en oefen gesag uit volgens verskeie bemagtigingsbasisse. Ook hierdie gesagsinvloede kan deur verskillende ontwikkelaars verskillend aangespreek word. Sommige mag dit as inperkend ervaar, terwyl andere groter vryheid ervaar waar dit dieselfde beïnvloedingsbasis aangaan.

Navorsingsmetode gevolg: Die positivistiese navorsingsparadigma is gebruik waar dit navorsers bemagtig om patrone en eenselwighede te vind in soverre dit bemagtiging, gebruik van sisteem ontwikkelingsmetodiek en sukses aangaan. `n Opname is gedoen en `n vraag aangewend vir data-invorderingsdoeleindes. Vraagstellingsdata is analiseer deur gebruik te maak van IBM SPSS Statistiese weergawe 21, Vrystellings 20.0.0 sagteware pakket instrumente.

Hoof Bevindinge: IS bestuurders maak gebruik van sisteem ontwikkelings metodologieë met die doel om beheer oor spanlede te verkry. Daar was egter geen duidelike persepsie betreffende die aanname dat hierdie metode as onderdrukkend deur sisteem ontwikkelaars ervaar word nie. Hierdie punt van besluitneming is bereik deurdat die meerderheid van die respondente nóg instemmend, nóg ontkennend reageer het. Navorsing het getoon dat die oorgrote meerderheid van organisasies die gebruik van sisteme aangepas het op `n projek tot projek grondslag, waarna verwys word as die gebeurlikheidsgebruik van sisteem ontwikkelings metodologieë.

Hoof Gevolgtrekking: Gesag word interpreteer in terme van die tipe gesag wat uitgeoefen word deur IT professionele en spesifiek IT ontwikkelaars en hul verskeie bestuurders en werksplekke. Die rolspeling en verskillende bekragtigingstipes waarvan gebruik gemaak word in organisasies voorsien `n aaneenskakeling betreffende wie die uiteindelike gesagsbeoefenaar is waar dit kom by die gebruik en sukses ratio van sisteem ontwikkelingsmetodologieë. Die aaneenskakelende gebruik van hierdie metodiek voorsien `n vorm van vryheid aan ontwikkelaars. Baseer op navorsingsuitslae, word die volgende

vraag aangaande uitkomste voorgestel; onderdruk sisteem ontwikkelingsmetodiek sisteem ontwikkelaars terwyl dit I.S. bestuurders bemagtig?

Sleutelwoorde:

Krag/bemagtigings sisteemontwikkelingsmetodiek, sisteem ontwikkelaars, informasie sisteem bestuurders, voortvloeiende gebruik van sisteem ontwikkelings metodiek.

CONTENTS

Chapter 1

Introduction

In this chapter the problem description, research goals, research method, research contributions and the outline of the study are going to be discussed.

1.1 Problem description

A project manager can exert power through nine influence bases available to project managers namely authority, assignment, budget, promotion, money, penalty, work challenge, expertise and friendship (Schwalbe, 2010). A broader analysis of these influence bases is crucial in understanding the associated effects. This type of power exerted or experienced can be perceived differently by systems developers. This may be associated with how power is perceived by different individuals with different personalities. While some might feel constrained, others might actually feel liberated by the existence of the same influence base.

Information systems are important to organizations (Fowler and Walsh, 1999). However there are problems being encountered in the IS industry, specifically in systems development (McAvoy and Butler, 2009). The need to increase the rate at which systems are developed to cater for user needs and the need for effective systems are some of the major sources of problems. These problems can be solved by the effective use of systems development methodologies.

Research has been carried out on systems development methodologies but however there seem to be perceptual incongruence between systems development managers and developers (Huisman and Iivari, 2006). Research shows that while managers are more positive towards systems development methodologies (Huisman and Iivari, 2006), developers on the other hand seem to resist and not to use systems development methodologies in their entirety but instead adapt, tailor, modify and change them depending on the project at hand (Mishra and Mishra, 2011). This is termed the “contingent” use of systems development methodologies. The term “contingent” with regards to the use of systems development methodologies means selecting a methodology that best suits a project. This selection depends on certain characteristics exhibited by the project such as the type of project, project objectives and the projected life of the project.

Avison and Fitzgerald (2006) highlighted that, “most systems development methodologies are designed for situations that follow a stated or unstated ideal type”. The systems development methodologies provide a step-by-step prescription for addressing this ideal type. However, situations are all different and there is no such thing as an ideal type in reality. We therefore see a contingency approach to information system development, where a structure is presented but tools and techniques are expected to be used or not (or used and adapted), depending on the situation. Van Slooten and Schoonhoven (1996), in their research also highlighted that the linear way of working during systems development is abandoned in practice, due to specific requirements of the specific situation.

Though the contingent use of systems development methodologies might have its advantages, there are also problems associated with it. Firstly, some of the benefits of standardization might be lost. Secondly, there is a wide range of different skills that are required to handle many approaches. Thirdly, the selection of an approach requires experience and skills to make the best judgements. It has been suggested that certain combinations of approaches are untenable because each has different philosophies that are contradictory (Avison and Fitzgerald, 2006).

Research also shows that some organizations are reluctant to adopt systems development methodologies, due to a lack of knowledge in the use of such systems development methodologies. Researchers feel that there is need for developers to drastically change their work habits and acquire new skills so as to efficiently apply systems development methodologies (Chan and Thong, 2009: 803). Some of the systems development methodologies are inflexible in that they do not allow for changing business processes and changing user requirements. Change is inevitable and therefore such systems development methodologies will just be there as a fixed template but not serving the purpose of meeting user requirements.

This translates to systems developers who fully understand systems development methodologies but failing to solve user problems. The routine use of a systems development methodology also leads to a problem of developers just performing tasks – addressing the ‘how’ part without fully understanding the ‘why’ part of problem solving. Many problem situations and information systems development projects are multifaceted, suggesting that systems development methodologies in more than one class would be appropriate. Furthermore projects take on different characteristics as they progress. A project may be ill-structured at the outset, demanding softer techniques, but a well-

structured objective set and requirements definition may result, at which time harder techniques will be appropriate (Avison and Taylor, 1997).

How systems developers perceive the use of systems development methodologies and power may influence the implementation and success of these systems development methodologies. This leads to questions on how systems development projects are managed. Is power being used by IS managers to enforce the use of these systems development methodologies on developers? What is the link between the success rates of projects developed using systems development methodologies and the use of power?

In this section the problem description was discussed. To help us understand the main aim of this research, the research goals are now going to be discussed. This leads us to the next section.

1.2 Research goals

The main aim of this research is to study the influence of power on the success of systems development methodologies. In order to reach this aim the following goals will be addressed:

1. Systems development methodology use – Describe the current situation with regards to systems development methodology use in South Africa.
2. Determine the effectiveness of systems development methodologies in South Africa.
3. Determine the perception of developers with regards to systems development methodologies and power.
4. Determine relationships between:

a) Power and systems development methodology use.

b) Power and success of systems development methodologies.

For the researcher to address the above stated research objectives, a research method that will allow the researcher to fully answer the research objectives will have to be chosen and applied. The next section outlines the research method to be used.

1.3 Research method

The positivistic research paradigm will be used. It allows the researcher to find out patterns and regularities between:

- Power and systems development methodologies use
- Power and success of systems development methodologies

This means the researcher will be able to generalize based on the patterns discovered regardless of the occasion or researcher's personal values and beliefs. The researcher will be neutral and objective and act as an impartial observer (Oates, 2006).

A survey will be used as a research method. A survey will allow the researcher to obtain the same kinds of data from a large group of people in a standardized and systematic way (Kelley *et al.*2003). The survey will be carried out in South Africa, so only organizations in South Africa will be considered. The researcher will focus on organisations that develop systems. These organisations will be targeted electronically via their websites and also telephonically.

The researcher will compile a list of contact people per each organization that would have agreed to be part of the study. This will serve the purpose of acknowledging receipt of the questionnaires and distributing them in the organization. A package of standard questionnaires will then be sent to contact persons in each potential organization. Postal method will be used for survey data collection, as well as electronic method (emails) and personal administration. A survey protocol in the form of an excel spread sheet will be used to keep track of questionnaires received and those that will still be pending. For outstanding questionnaires, reminders will be sent electronically to the organizations once a week. The survey will mainly target individuals with a special focus on IS managers and developers.

A questionnaire will be used as a data collection method because it allows the researcher to gather responses in a standard and systematic way, hence objective. Every respondent will be presented with the same questions, and measurements will be done and analysed objectively. The questionnaire will be pilot tested on a group of peer researchers, to ensure that the questionnaire accurately captures the intended information. The researcher will employ a combination of open-ended and closed-ended questions. Open ended questions give the respondents room to fully express their views and closed ended questions narrow down the choices for easier analysis purposes.

The research variables to be included in the questionnaire are the background information of the respondents in terms of the roles they assume at their workplaces. The highest qualification attained and personal experience in systems development (this will be classified in years ranging from none to more than 10 years). The size of the respondents'

organisation's IS department and also the business area of the organisations. The respondents will be asked to indicate on whether they are using systems development methodologies or not. If the respondents are using systems development methodologies, they will be asked to indicate the intensity, how widely they are using the systems development methodologies, the strictness of use and their expected future use of systems development methodologies. Respondents will be provided with a list of questions on systems development methodologies offering support as a control technology and they have to indicate whether they totally agree or not with the provided statements.

Respondents will be asked to provide a description of the last project they were involved in including the size, duration, cost of the project and the systems development methodology used. Statements on the possible last systems development project outcome that the respondents were involved with will be provided and the respondents have to select the one that best describe their last systems development project outcome. Statements on systems development methodologies providing quality of process and product will also be provided, respondents have to indicate whether they totally agree or not to the statements. Respondents will be asked to highlight their perceived individual power at the workplace and also indicate the use of power in their organisations. A list of types of power that an individual can exercise or experience will be provided and respondents have to indicate the extent to which they leverage or experience these different types of power at work. They will be asked to indicate the three sources of power most critical for them to leverage in the next five years.

For data analysis, descriptive statistics, reliability analysis, factor analysis, regression analysis, t-test and correlation analysis will be performed. Since the researcher wants to analyse the relationships between components that is, power and the use and success of systems development methodologies, regression analysis would be the ideal tool to analyse the relationships between these variables. Using regression analysis the researcher can also see the relative strength of the independent variable's effects on the dependent variables and with all these findings the researcher will be able to make predictions.

In this section, the research method (survey) to be used was highlighted together with the data collection method (questionnaire). Data analysis techniques to be employed were also highlighted. In the next section, the research contributions are going to be highlighted.

1.4 Research contributions

This research will help to answer the following question- Is the use of systems development methodologies empowering or enslaving Information Systems managers and developers? However, there is not much information with regards to the influence of power on systems development methodologies. Therefore there is need to pursue the research. This research will be useful at two levels, theoretical and practical level. Theoretically, to add more knowledge and shed some light on the link between power and the success of systems development methodologies. This will be mainly useful to academics in the field. Practically, to provide insight to practitioners in the industry as the research aims to ease resistance with regards to the use of systems development methodologies.

The use of systems development methodologies by organisations in South Africa will be explored. This research will also help in identifying the following:

- The type of systems development methodologies being mostly used by organisations in South Africa.
- How widely systems development methodologies are being used.
- The intensity and vertical of use of systems development methodologies.
- The strictness levels being followed when using systems development methodologies.
- The future use of systems development methodologies.
- The descriptive review of the link between personality types and perception of power.
- The relationship between power and success of systems development methodologies

The next section outlines the contents of the study. The main aim of this section is to inform the reader of what to expect in the following chapters.

1.5 Outline of the study

The outline will be as follows:

- Chapter 1 - Introduction, problem statement, aims (purpose of research)
- Chapter 2 - Literature review on power and systems development methodologies

- Chapter 3 - Empirical investigation on research paradigms (positivistic, interpretive, critical social)
- Chapter 4 – Results
- Chapter 5 - Discussion and interpretation of results and also conclusions and recommendations

In this chapter the problem description, research goals, research method and research contributions were highlighted. This provided the foundation of the research. The outline of the rest of the chapter was also provided, which serves to pave the way on what to expect in the coming chapters. In order to effectively explore the research objectives, the next chapter is going to focus on systems development methodologies (definition, use, types, effectiveness and success) as well as the definitions and various types of power.

Chapter 2

Literature review

In this chapter, we are going to explore the definition, uses, types, effectiveness and success of Systems Development Methodologies (SDM). The definitions and various types of power are also going to be discussed. The overview of this chapter is illustrated in Fig 2.1 below:

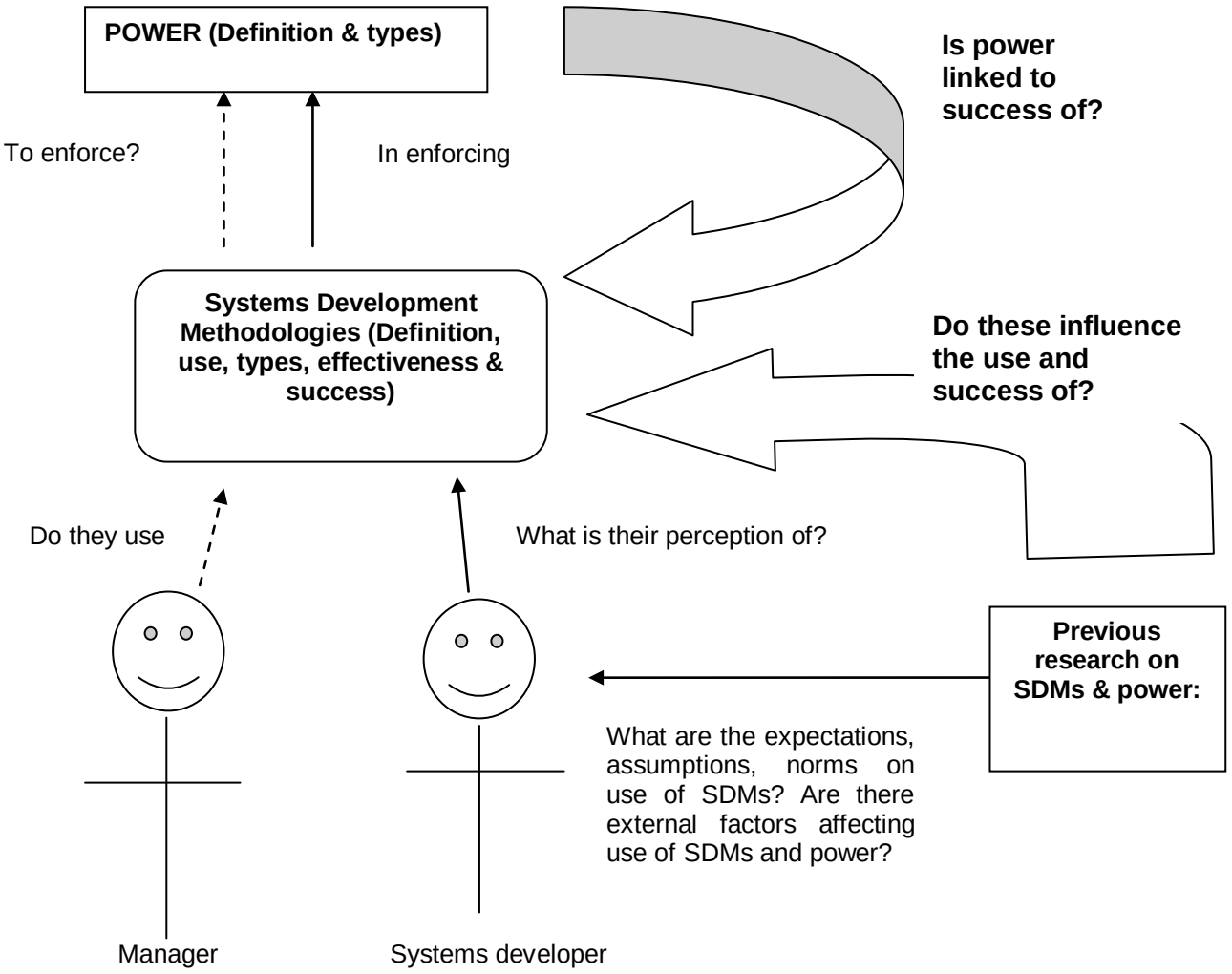

Fig 2.1 Overview of chapter 2 (Conceptual framework)

Based on previous research on Systems Development Methodologies and power, we are going to explore the expectations, assumptions and norms on use of Systems Development Methodologies. The possibility of existence of external factors which might affect the use of Systems Development Methodologies and power is also going to be discussed. This will lead to an analysis of the perception of IS managers and systems

developers with regards to Systems Development Methodologies and power. In exploring these perceptions the following investigations are going to be examined:

- Do managers use Systems Development Methodologies with the aim of enforcing power on systems developers?
- Do systems developers perceive the use of Systems Development Methodologies as a form of enchainment and as such as restrictive as opposed to empowering?
- Is power closely associated to the success of Systems Development Methodologies?
- Does the perceptions and individual perspectives of IS managers and systems developers influence the utilisation and success of said Systems Development Methodologies?

2.1.1 Definitions of power

Schwalbe (2010) defines power as the potential ability to influence behaviour in order to get people to do things they would otherwise disallow and oppose and Heiskanen *et al* (2008) interpret power as the ability to manipulate the other person's point of view in order to obtain maximum manufacture and creativity on a particular issue. Power can thus be defined as the documentation that imparts authority to a specified portion of professionals in the industry and which enables them to come into possession of this authority and thus freely exercise said authority. Markus and Bjørn-Andersen (1987), elucidate, that exercising power entails the ability of one party or body to reshape the behaviour of another with the intention of gaining influence. They also accentuated that power can be exercised by an individual or collectively through its professionals or a company. In their research they stated that the IS management environment, the organisation to ensure that results can be achieved, presents many opportunities to exercise power when related to system development projects. A representative case would be the decision on the appositeness and effective application of Systems Development Methodologies. Mintzberg (1983) simplifies this definition as the capacity to effect or initiate organisational outcomes.

2.1.2 Various types of power

According to Markus and Bjørn-Andersen (1987), the exercising of power can either occur within a specific context of a specific IS developmental project, or within the IS management environment as an entity. Additionally, a target for the implementation of power is essential. This may target authentic issues or values and attitudes of

shareholders within an organization. This utilisation of power can be categorised into four main groups namely:

1. The technical exercise of power – This can be achieved by IS professionals influencing the decisions of consumers in their selection of technical systems design features. This can be structured in the form of recommendations that the other parties feel accountable to accept.
2. The structural exercise of power – This can be enforced through the implementation of structures or frameworks within an organisation which promotes reliance on destined individuals. Another example might be the establishment of limits which necessitate approval from managers in order for crucial decisions to be arrived at and finalised.
3. The conceptual exercise of power – It can be achieved through manipulation, shaping and determining of values and attitudes of individuals or groups. In this case, the other party is not given the room to freely express its own opinions and hence those individuals, entities or companies can be referred to as "powerless."
4. The symbolic exercise of power – This can be achieved through an established symbol, for example; through the products of systems development processes. The notion will be that these products aid individuals in reaching goals and objectives at an individual level when in fact they aid organisations in meeting organisational goals at a corporate level as well.

These various types of power exercise are summarised in figure 2.2 below:

		Target of power exercise	
		Issues of fact	Issues of values
Context of power exercise	Specific development project	Technical	Conceptual
	IS management policy	Structural	Symbolic

Fig 2.2 Types of power exercise (Markus and Bjørn-Andersen, 1987)

It should, however, be noted that these varying methods of exercising power entirely depend on the context in which they are utilised. Exerting power can be seen as the degree of control one has in achieving certain objectives. Whether this benefits the individual or an organisation, a form of power needs to be exercised. A project manager has the ability to exert power via nine bases of control available to project managers. These comprise exercising authority, handing out assignments, budgeting, promotional incentives, monetary results, enforcing penalties and work challenges, demanding expertise and offering friendship (Schwalbe, 2010).

Authority as a base of influence is exerted through the legitimate hierarchical right to issue orders. Assignments are enforced through the project manager's perceived ability to influence a worker's ensuing work assignments. The budget based influence consists of the project manager's perceived ability to authorise the use of discretionary funds. Influence exerted through promotion, is described as the ability to improve a worker's position. A payment influenced base is viewed as the authorities' ability to increase a worker's pay and benefits. The influence based on penalty, is viewed as the project manager's perceived ability to punish or to withhold benefit or promotion.

The ability to assign and control assignments that capitalises from a worker's enjoyment of performing a particular task is termed: "the work challenge influence base."

Influence that stems from expertise shown during performance of an assignment is defined as the project manager's perception of his staff member's expertise; of that which renders the employee's services important.

Production that stems from relationships of trust is described as the ability to establish friendly personal working conditions between the project manager and staff.

Sources that control power at work may include the authority brought about by position, the influence of charisma, positive command of relationships, being in possession of information, achievement through expertise and the ability to punish and reward. (Bal *et al*, 2008):

- The power of position is the formal authority derived from a person's title or position within the established group or an organization.
- The power of charisma is the influence that is generated by a leader's style, personality or general state of mind.
- The power of relationships is the influence that leaders gain through formal and informal networking, both inside and outside their organizations.

- The power of information entails the control that is generated through the use of evidence deployed to state an argument.
- The power of expertise is the influence that expands from developing and communicating expert knowledge or the impression of possessing trustworthy knowledge.

From afore going discussions, it should be derived that similarities exist as concerns the power of being associated with a distinct measure of influence that employers exert over employees in order to achieve a certain objective. The one exercising power will exert influence over the one staff member being investigated. Differences related to the context in which the power is being exercised as well as to the way in which this power is being perceived by both the one wielding power and the one submitting to it. In the next section, we are going to explore various definitions of Systems Development Methodologies as well as investigate the use and effectiveness of said systems development methodologies.

2.2 Systems Development Methodologies (SDMs)

A Systems Development Methodology is defined as, a "meta-system within its own right, incorporating skilled people, organization, tools, methods, techniques. The Systems Development Methodology is for individuals, teams and teams incorporating other teams, and can address problems from the small to the global, from the technological to the social and international" (Hitchins, 2007). Systems Development Methodologies provide a structure in the development of various Information Technology Systems and these development methodologies differ in philosophical approaches so as to comply with the dynamic nature of Information Technology.

Systems Development Methodologies have evolved over time, bringing about change, both positive and negative. The need to effectively comprehend user requirements and deliver working systems, to some extent facilitated the evolution and introduction of Systems Development Methodologies. This transition and the need to cater for changing user requirements, however, also brought about the need for users with exceptional skills, who can effectively utilise these systems and benefit from said sophisticated systems. As a result, the developers now need to be better acquainted with working tools so as to easily and quickly adapt to the constantly changing environment.

2.2.1 Definitions of Systems Development Methodologies

In this section the concept of Systems Development Methodologies will be defined. We will present various definitions of the term. Each definition will be analysed to find words or phrases that are linked with the concept of "power". This will help us to reach a better understanding of the function of power in the use of Systems Development Methodologies.

For example; "Systems Development Methodologies contribute to the **discipline** and **control** of work in IS departments. These methodologies shape both the systems development and the procedures of maintenance (Sauer and Lau, 1997). Table 2.1 summarises the various definitions of Systems Development Methodologies. In this table, words that can be directly related to the concept of power, are printed in bold.

Table 2.1 Definitions of Systems Development Methodologies

Definition	Reference
"An organized collection of concepts, methods (or techniques), beliefs, values, and normative principles supported by material resources … and a codified set of goal-oriented 'procedures' which are intended to **guide** the work and cooperation of the various parties (stakeholders) involved in the building of an information systems application."	Mihailescu and Mihailescu, 2010
It is a collection of procedures, techniques, tools and documentation aids which will help the systems developers in their efforts to implement a new information system. A methodology will consist of phases, themselves consisting of sub-phases, which will **guide** the systems developers in their choice of the techniques that might be appropriate at each stage of the project and also help them **plan, manage, control** and evaluate information systems projects.	Avison and Fitzgerald, 2006
A methodology is a framework that is used to **structure, plan**, and **control** the process of developing an information system. The framework of a software development methodology consists of: a) A software development philosophy, with the approach or approaches of the software development process.	Lin *et al*. 2009

b) Multiple tools, models and methods, to assist in the software development process.	
A methodology describes the way in which things should be done as is fitting in in different organizations.	Schwalbe, 2010
"A methodology can be viewed as consisting of three major components: a) A breakdown of work structure that provides **guidelines** as to how to react and when to do so. b) Techniques on how to achieve what needs to be done. c) Advice on how to **manage** the quality of the results achieved. The purpose of a methodology is to assist a developmental group in successfully adapting object systems which involves perceiving, generating, assessing, **controlling** and carrying out the proposed system changes that are to be administered."	Papatsoutsos, 2001
An Information Systems Methodology consists of a study of Information Systems Methods.	Mingers, 2001

It should be noted that there are key similarities in most of the definitions and these are:

1. People – people are incorporated in the sense that developers use and follow a methodology as a guideline in systems development and users benefit from the effective implementation of this methodology.

2. Tools and techniques – these include, for example, prototyping and time-boxing which aid in rapid systems development.

3. Method – a 'recipe' of, guideline or steps to be followed during implementation of a methodology.

4. Documentation – a certain level of documentation necessitated to aid developers in the effective implementation of methodology.

For the purposes of this research, the following definition is going to be used:

A Systems Development Methodology is viewed as consisting of a philosophy, method, processing data, tools and techniques. It provides a framework which serves the purpose of guiding procedures necessitated by an information system. The words in bold: "**guide", "manage", "structure" and "control",** refer to an element of leadership, control and hence power. To **guide** refers to the act of providing direction, be it in a set or unset path. To **manage** implies being able to assert, achieve or to cope and the term assumes a certain level of constraint. To **structure** or provide a structure means to set a standard which will act as a support. This groundwork can be used for purposes of comparison. To **control** necessitates regulating or governing, based on desired or set standard

In this section the various definitions of Systems Development Methodologies have been explored. An analysis was performed in order to find words or phrases that are affiliated to the concept of power whilst defining a Systems Development Methodology. Some of these words found included "**discipline**", "**contro**l", "**guide**", "**manage**" and "**structure**". It was noted that in defining what constitutes a Systems Development Methodology, links to the concept of **power** became clear. A definition for a Systems Development Methodology used for this research, was also indicated. Bearing in mind all this, we are now going to explore various types of Systems Development Methodologies.

2.2.2 Types of Systems Development Methodologies

There are various ways in which to classify Systems Development Methodologies. Iivari *et al* (2000) classifies a Systems Development Methodology as "an organized collection of concepts, methods, beliefs, values, and normative principles supported by material resources and a codified set of goal-oriented 'procedures' intended to guide the work in cooperation of the various parties (stakeholders) involved in the building of an information systems application." Jayaratna (1994) classifies a Systems Development Methodology as set off against three elements:

- the problematic situation;
- intended solution;
- the problem solving process.

For present research, the classification of Avison and Fitzgerald (2006) will be used as it focuses on a "philosophy" which is also compatible with the definition for a Systems Development Methodology provided for specifically in this research.

Systems Development Methodologies can be categorised based on their underlying philosophy into process-oriented, data-oriented, object-oriented, human-oriented and Agile Systems Development Methodologies (Avison and Fitzgerald, 2006). Table 2.2 illustrates some examples of these various types of Systems Development Methodologies. In the table, words that can be linked to the concept of **power** are highlighted in bold.

Table 2.2 Types of Systems Development Methodologies

Type	Description	Examples
Process-oriented	Focus on functionality and processes. They are the sets of skills and mechanisms used to efficiently and effectively implement policy, planning and **management** activities that involve groups of people interacting, often in decision-making. They provide structured approaches in order to reaching desired outcomes. (Mc Conney *et al*. 2002)	• Structured Analysis, Design and Implementation of Information Systems (STRADIS). • Yourdon Systems Method (YSM). • Jackson Systems Development (JSD)
Data-oriented	The structure of the data is the main focus. The tools and techniques focus on logical data modelling, data flow modelling and entity behaviour modelling.	• Structured Systems Analysis and Design Method (SSADM • Information Engineering (IE).
Object-oriented	According to Dori (2006), the object-oriented paradigm dominated the software world since early 1980s. This domination facilitated object-oriented analysis and design methods. Object oriented systems are made up of interacting objects that maintain their own local status and provide operations on that state. "Changing the implementation of an object or adding services should not affect other system objects. Due to the fact that objects are associated with things, there is often a clear mapping between real-world entities and their **controlling** objects in the system". (Sommerville, 2011) Object oriented methodologies aim at providing a	• Coad and Yourdon Object-oriented Analysis (OOA) Methodology. • Rational Unified Process (RUP).

	method which helps to ensure that the products are delivered to the user on time and within budget, that the products meet user requirements, that user requests modify the system and/or fixing bugs are responded to in time and that increasingly sophisticated products are offered so as to keep a competitive edge that the changes in standards and delivery technology are kept up and the project team feels motivated and successful. The fundamental concepts include: • Problem domain vs. Implementation domain; Object and Class; • Encapsulation; • Information hiding; • Inheritance; • Polymorphism; • Communication between objects.	
Human-oriented	Focus on incorporating the social and technical aspects into the development process.	• Effective Technical and Human Implementation of Computer-based Systems (ETHICS) • KADS • Common KADS
Agile	Some authors believe that the need to move away from **restrictions** imposed by the **rigid** plan-driven characteristics of traditional methodologies resulted in the development of Agile Systems Development Methodologies. As a result, Agile Systems Development Methodologies were developed as an alternative to traditional methodologies such as the Waterfall, to counteract the problems encountered by the use of traditional Systems Development Methodologies. Agile Systems Development Methodologies embrace change, uncertainty and can **control** unpredictability by using the benefits of adaptability. Such methodologies are used to produce higher quality software in a shorter period of time. Since there is constant interaction between the developers and users, Agile Systems	• James Martin's RAD (JMRAD). • Web Information Systems Development Methodology (WISDM). • Scrum, Dynamic Systems Development Methodologies (DSDM) • XP (Extreme Programming) • FDD (Feature-Driven Development) • Open source development • Crystal family • Agile Unified Process (AUP) • Lean software development

	Development Methodologies ensure flexibility and responsiveness to the changing environments and customer demands. This is also facilitated by the **monitoring** of feedback resulting from initial decisions. The **management** style of leadership and collaboration might mean transparency and dilution of **management power** and those are not readily accepted by some IS managers in today's companies who feel that the ability to **exert some form of power** over developers is directly linked to the effectiveness and success of project development. "Agile Systems Development Methodologies argue for project managers to give away their **control** function and act as **facilitator** and act to promote continuous learning. This may be difficult, as project managers and IS managers both view **control** as the most crucial of all four (learning, **control**, efficiency and flexibility) factors in success of IS projects" (Subramanian *et al.* 2009:119).	

It can be deduced that there are different categories of Systems Development Methodologies which emphasise different aspects of systems development. The final outcome rests entirely with the developers in effectively applying Systems Development Methodologies in order to solve problems. These Systems Development Methodologies constitute by and large a collection of methods, models, tools and techniques, the efficacy of which depend on the originality and resourcefulness of an individual. Systems Development Methodologies provide a platform of standardisation for all developers within a certain organisation as all developed systems will be compared with and assessed according to the agreed upon tools and techniques, methods and processes. These Systems Development Methodologies also serve as a guideline and starting point for novice developers. It should also be noted that terms such as **power, control and management** are associated with most of the applicable descriptions and will be later investigated in greater detail.

2.2.3 Success of Systems Development Methodologies

Innovation, both in utility and functionality, is a prequisite to the ultimate success of a project and has caused an ever-expanding increase in the complexity in development of software projects. This complexity has, in the past, often been addressed by Systems Development Methodologies (Dubey, 2011). Success of a software project is said to ultimately depend on successful implementation of a Systems Development Methodology. Implementation, which in turn, relies on non-technical variables such as an organisational culture, the structure of the organisation and the adaptability of management strategies put into place as response contingencies (Hiatt and Creasey, 2003). This Systems Development Methodology governance introduces an important measure of CONSTRUCT of management and power. An organisation's structure provides a framework for the communication and allocation of duties and responsibilities. These functions and responsibilities entail attached power levels to be adhered to. Systems Development Methodologies solely serve to guide and regulate and signify a structure for developers to abide by. They provide a standardised platform for purposes of comparison and measurement.

According to Fowler and Walsh (1999), the measure of success attained by a Systems Development Methodology is primarily interconnected with the resultant satisfaction of end-users. This gratification is related to the system as originally applied. Research has been carried out in order to review the differences in perceptions of success attained in an information systems project. The results revealed that, in addition to the introduction of formal Systems Development Methodologies such as SSADM and a Project Development Methodology, PRINCE has been used in the development of an information system project and additional factors were observed to significantly influence the perceptions of the ultimate success of the project. It was noted that greater user participation gave some users considerable leverage in promoting their personal interests. Some **political** factors were also determined as influencing the final outcome of the project. This was perceived in the variety of perceptions of success observed amongst different users of the system, as validated by different managerial levels and departments (business units).

Systems Development Methodologies have expanded measurably and each Systems Development Methodology reveals its own strengths and weaknesses. It is entirely up to developers to select the most applicable Systems Development Methodologies in meeting user needs. In this section we have explored the definitions, types and successes of existing Systems Development Methodologies. Keywords which link to an element of

power were highlighted and explained. The next section aims to explore previous research on Systems Development Methodologies and power. This will assist in answering the research question, “Are Systems Development Methodologies empowering tools or are these enslaving IS developers and managers?”

2.3 Previous research on Systems Development Methodologies and power

A critique on an object of art or a piece of literature can be positive or devastating, depending on the critic's personal, subjective taste (Mc Avoy and Butler, 2009). Research by Huisman and Iivari (2006) revealed that the perceived incongruity of different outlooks between IS managers and systems developers, imply different expectations, assumptions and norms with regards to Systems Development Methodologies. Managers were perceived to be more positive with regards to the use of Systems Development Methodologies. They reviewed the support obtained from Systems Development Methodologies more optimistically than did systems developers. A question was posed in their research as how to management would, if necessary, persuade systems developers to accept Systems Development Methodologies as of greater value. Culmination of communication between managers and developers should be utilised. Management should, additionally, exert their power to sway the perceptions of systems developers.

Various external factors could prove destructive to performance of behaviour. These external factors may involve managerial control where management influences developers to use an information technology in a certain way. Another method could entail management placing constraints on the developer through the design of an information technology (Green and Hevner, 1999). Systems Development Methodologies provide developers with support as to options available at various stages in the developmental process. These also provide managerial control over developmental procedures by presenting a series of milestones to be completed at each stage. Resulting from this, Systems Development Methodologies are expected to ensure the successful implementation and control of system development projects (Westrup, 1993).

Avison and Fitzgerald (2006) highlighted that, “most Systems Development Methodologies are designed for situations that pursue a stated or unstated ideal. The Systems Development Methodologies provide a step-by-step prescription formulated to address this standard of perfection”. By doing so, they were reacting to the “one Systems Development Methodology for all developments”, every situation is unique, therefore demanding the

contingent use of Systems Development Methodologies. A Contingent Systems Development Methodology allows for different approaches depending on the requirements of the situation.

Van Slooten and Schoonhoven (1996) just like Avison and Fitzgerald (2006), in their research also highlighted that “in practice**,** the linear way of working during information systems development is abandoned, due to specific requirements of the specific situation. Different circumstances, resulting from different application domains, interest groups, business strategies, cultures and skills, require different approaches, various methods and tools, and the performance of a different set of development tasks in a different sequence”. They further explicated and defined contingency factors as “circumstances regarding the project, influencing in some way or other the selection or construction of an approach (method) to systems development”.

The contingent use of Systems Development Methodologies might offer flexibility of control on the part of systems developers. In such an instance, though management may oversee that the steps are followed, the applicability of the Systems Development Methodology per given situation may be decided upon by the systems developers. Systems Development Methodologies may not in some instances be used in their entirety. The fact that an organization has a Systems Development Methodology in place, even if not used extensively, may suggest a form of power exercised by management control over systems developers. This concerns the research objective which needs to be addressed: Are Systems Development Methodologies empowering or enslaving systems, aiding or holding back IS managers and developers respectively?

One of each classification of Systems Development Methodology has been selected and an analysis of the frequency of the use of keywords such as **power, control,** and **management** in the description of what constitutes that specific example of a Systems Development Methodology has been done. This has been documented in table format with the first column representing the keywords **“power”, “control”** and **“management**”. The second column has been compiled for Process-Oriented Systems Development Methodology – Jackson Systems Development (JSD). The third column has been created for an example of Data Oriented Systems Development Methodology – SSADM. The fourth column consists of an example of Object Oriented Systems Development Methodology – Coad and Yourdon Object Oriented Analysis Methodology (OOA). The fifth column has been set up for Human Oriented Systems Development Methodology –

ETHICS. The last column has reviewed Agile Systems Development Methodology – Scrum. The descriptions for each of the five specific examples; one for each type of Systems Development Methodology, have been used to complete the table and keywords related to **power, control** and **management** have been highlighted in bold. This has been summarised in table 2.3:

Table 2.3 An analysis on the frequency of the use of keywords such as power, control and management in describing what constitutes a specific example of an SDM

Keyword	Process oriented for example Jackson Systems Development (JSD)	Data oriented for example SSADM	Object oriented for example Coad and Yourdon Object-oriented Analysis (OOA) methodology	Human oriented for example ETHICS methodology	Agile for example Scrum
Power	Conceptual exercise of **power** in that it is perceived as "non-inspirational and teachable, ensuring that, different programmers will produce similar programs given a particular developmental situation". (Fitzgerald et al.2002)	It is perceived that data in the structures of SSADM makes it teachable. "The successful implementation of the methodology relies on the skills of key personnel being available" (Avison and Fitzgerald, 2006). This is a form of structural exercise of power as there is dependence on the set skill of key personnel for the methodology to be a success.	Most activities in the OOA methodology are about increasing the analyst's understanding of the problem domain. This is a form of the symbolic exercise of power. By following the methodological activities, it's perceived that the analysts are "aided" in their day to day work tasks and in reaching individual goals when in fact the activities are enabling the meeting of organizational goals.	"The methodology encompasses the socio-technical view that for a system to be effective, the technology must fit closely with the social and organizational factors" (Avison and Fitzgerald, 2006). This is a form of the symbolic exercise of power. The methodology is perceived to produce a "conducive" work environment to facilitate the attainment of organisational goals and not individual goals.	"The deliverable determinants are market intelligence, customer contact, and the skill of developers" (Schwaber, 1990). Since the skill levels of developers are perceived to directly affect the delivered product, this in a way influences the values and attitudes of developers. This can be classified under the conceptual exercise of power.
Control	"Since most systems are complex in three different dimensions – functions, data, timing and **control**- it is useful to	The methodology recommends quality assurance reviews which can be meetings to review the	A criterion for evaluating objects is used as a way of **controlling** the identification of too many objects. For example, ensuring that all the objects are	The methodology facilitates a change process and therefore it is likely to involve conflicts of interest between all	Identified benefits include a good **control** over the development schedule mainly. (Rao *et al*. 2011)

	have three different types of models, Data Flow Diagrams, Entity Relationship Diagrams and State Transition Diagrams, each of which illustrates a single perspective of the system". (Fitzgerald et al.2002) This means in addition to data and procedural perspectives, a behavioural or status perspective was also recognised as an important dimension for systems development. This led to the introduction of a number of approaches with a more pluralist outlook, integrating these perspectives from the outset.	methodology. Post implementation feedback and audits are encouraged as a way to enforce **control**.	derived from the domain and not from implementation considerations.	participants in the development process. The successful implementation of new systems is therefore a process of negotiation between the affected and interested parties. This negotiation may be a form of **control** management within the developmental process.	
Management	It sought to eliminate the need for invention or insight on the part of the programmer. Hence providing a standard platform which is easier to **manage**. Knowledge can also be viewed as a source of	The methodology incorporates own set of plans, timescales, control and monitoring procedures. It provides project development staff with a framework of very detailed rules and guidelines to	This methodology, in order to reduce complexity of the model, groups subjects into more manageable subject areas.	**Management** may perceive participation as a way of achieving changes that would otherwise be rejected. "Participation is the involvement of those affected by a system being part of the decision making process concerning the design and	Focuses on project **management** in situations where is difficult to plan ahead, with an importance on feedback mechanisms. SCRUM fits well into small projects. Some work releases are created and requirements

	personal power and social capital as it is sought by others. (Ferris and Treadway, 2011)	abide by. The methodology outlines expected outputs from each stage and provides time and resource **management** guidelines.		operation of that system" (Avison and Fitzgerald, 2006)	can be prioritised in a well-structured manner. (Rao *et al*. 2011)

Based on the information recorded in table 2.3, it can be noted that the description of what constitutes a Systems Development Methodology for each example of each type of a Systems Development Methodology involved the use of the keywords **"power", "control"** and **"management**". This indicates that regardless of the type of Systems Development Methodology described, an element of power is linked to what constitutes its description.

IS developers are key players in the selection and use of Systems Development Methodologies. Whether they are directly or indirectly involved in the selection process of appropriate Systems Development Methodologies, researchers have dedicated time in finding as much information as is possible on personality traits. This may be due to the assumption that there is a belief that the identified traits can be linked to individual job performance and preferences. This can be the basis of employee selection and career guidance, leading to improved job performance. The next subsection explores values and traits associated with IS developers.

2.4 IS developer values and personality traits

People perceive the concept of **power** in different ways. Could this be linked to different individual values and personalities, as some perceive power as relational and situational? The notion exists that Systems Development Methodologies were sought as a solution to providing a systematic way of producing information systems seeing as early programmers were not necessarily good communicators. Systems developers are generally perceived as socially withdrawn individuals, who are more reserved in terms of personality (Fitzgerald *et al*.2002). Research shows that although relationships within an organisation constitute the basic building blocks of social networks, these relationships are influenced by factors such as individual attributes, behavioural patterns and perceptions. This in turn influences the procedures followed in an organisational culture. The pattern of relationships defines actors' positions in the social structure and provides opportunities

and constraints that affect the acquisition of power. Having direct access to resources, that might flow through a network, provides some participants with the upper-hand. Availability of alternatives provides some form of **power** over those dependent on the same alternatives (Ferris and Treadway, 2011).

Personality may be perceived as being comprised of unchanging traits and that explains why individuals react in certain ways (Mullins, 2010). Examples of personal traits may include independence, self-control, reservation, outspokenness, passivity, and aggression. To gain an understanding of a personality, one needs to observe the way the individuals carry themselves. “Personality can be thought of as the sum total of ways in which an individual reacts to and interacts with others” (Robbins, 2010). It is described in the quantifiable traits that a person displays. The most popular personality assessment instruments are the Myers–Briggs Indicator (MBTI) and the Big Five model. According to Robbins (2010), The **Myers–Briggs Indicator (MBTI),** is a 100-question personality test that asks of people how they usually feel or react under certain circumstances. Based on the provided answers, they are categorised as extroverted or introverted (E or I), sensing or intuitive (S or N), thinking or feeling (T or F), and judging or perceiving (J or P).

The terms are defined as follows:

- *Extroverted Versus Introverted*—extroverted individuals are outgoing, sociable, and assertive. Introverts are quiet and shy.
- *Sensing Versus Intuitive*—Sensing types are practical and prefer routine and order. They focus on details. Intuitive personae rely on unconscious processes and look at the overall impression.
- *Thinking Versus Feeling*— Meditative personalities use reason and logic to handle problems, whereas intuitive or sensitive personality types rely on their personal values and emotions.
- *Judging Versus Perceiving*—judging types want control over, and prefer their world to be ordered and structured. Perceiving types are flexible and spontaneous.

Research carried out by Lyons (1985); found that the most common personality type for software developers was Introversion, Sensing, Thinking, and Judging (ISTJ). This personality type was found to comprise from 25 - 40% of software developers. This personality trait is characterised by seriousness, quietness, high levels of concentration

and thoroughness. Part of most developers being introverts was attributed to the education level. It was highlighted that at least 60% of software developers had at least attained a bachelor's degree. The sensing attribute describes the decision making style of an individual. 80 - 90% of systems developers were found to be "thinking". Individuals with this thinking attribute are linked with impersonal, analytical, scientific and concerned with matters of truth characteristics. 50% of systems developers were found to be "judging" meaning they like to be practical, precise, specialise and develop a single idea in depth. This may be the basis for the different perceptions of power and the use of Systems Development Methodologies by software developers.

"Many organisations also use the social styles profile in team-building activities as well as DISC profiles" (Schwalbe, 2010). In the social styles profile, people are perceived as behaving in one of four zones based on their assertiveness and responsiveness. The four zones are drivers (proactive and task oriented), expressives (proactive and people oriented), analyticals (reactive and task oriented) and amiables (reactive and people oriented). The DISC profile uses a four-dimensional model of normal behaviour. The four dimensions which are Dominance (decisive outcome oriented), Influence (optimistic and strives to win others over), Steadiness (sincere and wants to maintain stability) and Compliance (data driven, works well alone), make up the name DISC.
A DISC profiling research was carried out by IBC (2002) on about 23 286 individuals whose ages were well distributed and 93% had gone beyond high school. Of the 68% employed; 24% were ranked as professionals, 24% as middle level management and 10% as executives. Developers constituted 7% of the classical pattern and also on the technical category. Developers were ranked on 23 out of 28 of the "D" segment and this segment is generally described with adjectives such as self-reliant (independent thinking), calculated risk taker (wild speculation not for this individual), unassuming (usually modest about own abilities) and self-effacing (reserved and low key in manner). This might influence the perception of systems developers with regards to power exercise by IS managers and success of Systems Development Methodologies.

According to Kendall and Kendall (2005: 336) the background of programmers and developers range from those who attained business degrees to those who attended technical schools or universities. They highlighted that there are certain attributes that are common to most successful programmers. These include:

- Deriving joy from coming up with workable solutions
- The ability to work under pressure and to work long hours
- Having self-discipline and being self-motivated. This character trait may make them averse to being controlled.
- Creativity in problem solving and working alone. Therefore they may feel that their creativity is being restricted and controlled by the use of Systems Development Methodologies.
- Managing numerous resources including people, budgets and strict deadlines

In their research they stated that developers/programmers need to possess good communication skills in order to effectively communicate with the users and fellow team mates. They must possess enough technical skills to interact with computer related equipment through the use of programming tools and techniques. Kumar and Bjorn-Andersen (1990) in their research came up with a model which illustrates the role of the developer values in information systems development. They highlighted that the background, for example education level reached and training attained as well as culture of information systems developers affect their values. These values in turn affect the whole Information systems development process. This was illustrated in Fig 2.3 below:

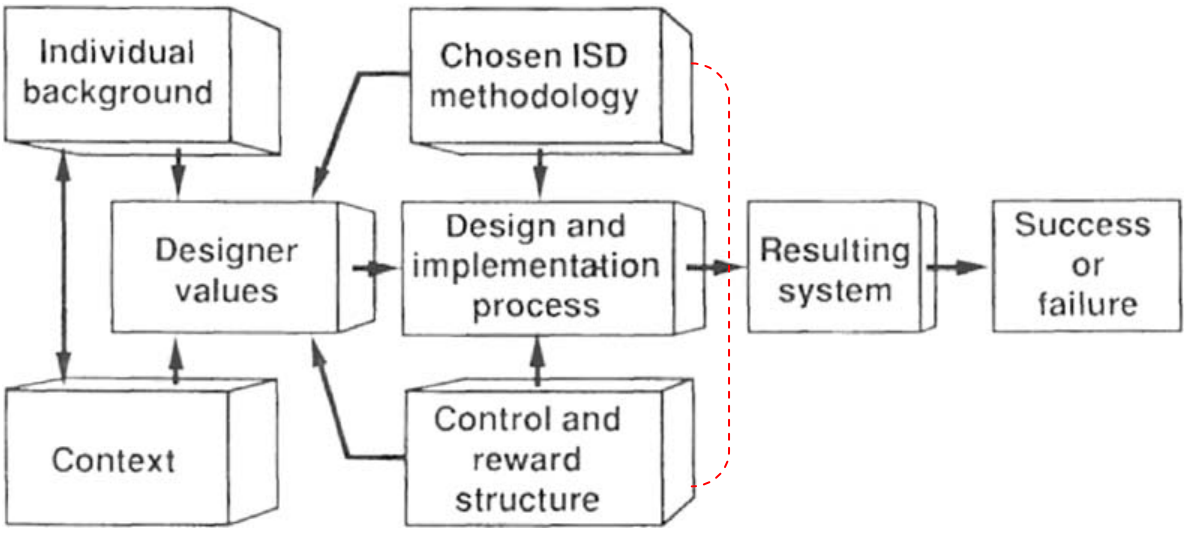

Fig 2.3 – Adapted from: Role of designer values in IS development (Kumar and Bjorn-Andersen, 1990)

Kankanhalli *et al*. 2004, also stated in their research that IS developer values differ due to differences in cultural contexts of IS developers and those of individuals in companies that hire them. They highlighted that these differences for example, language and culture can negatively affect offshore IS development. They suggested that training IS developers on

the use of Systems Development Methodologies and tools as well as being sensitive to user requirements could improve the technical values of IS developers. Such training provides a standard communication platform regardless of cultural differences and backgrounds.

Based on Figure 2.3, the background of the developers, which consist of education and training, influence the values they possess. The context which is made up of the culture and its associated constraints also plays a role in shaping the perception of IS developers and managers. This in turn may influence the design and implementation of Systems Development Methodologies in effectively meeting organizational goals. The control and reward structure may be linked to the motivational levels of IS developers and managers. This is also linked to the designer values. Some individuals are motivated by great rewards and benefits offered by an organisation. This can be in the form of money or other benefits. The applicability and effectiveness of a chosen Systems Development Methodology is directly linked to the design and implementation process. This is in turn linked to the success or failure of the resulting system. The dotted red line connecting the “chosen ISD methodology” and the “control and reward structure” represents a new link being investigated in this research.

Summary

In this chapter the definitions and various types of power were explored. It was noted that there is a link between power exercise and a certain level of influence. The four categories of power exercise, namely technical, structural, conceptual and symbolic, were discussed. The sources of power at the workplace that may be exercised or experienced by IS professionals were also highlighted. It was noted that there are similarities between these types of power exercise in that these types of power exercise are normally being undertaken to achieve a certain objective. The difference being that the context of the types of power exercise differs; this may also be linked to the different perceptions of power by individuals.

Definitions of a Systems Development Methodology were explored and the classification being followed in this research was pointed out. This classification consists of a philosophy, method, process model, tools and techniques. Key similarities in most Systems Development Methodology definitions being people, tools and techniques, method and documentation were noted. Types of Systems Development Methodologies

were discussed and the keywords relating to power, control and management were noted in what constituted the definition for the specific example per each type of Systems Development Methodology.

The success of a software project is said to be greatly dependent on the successful implementation of a Systems Development Methodology. This was highlighted in the discussion on the success of Systems Development Methodologies also discussed in this chapter. Previous research on Systems Development Methodologies was also done in order to acknowledge what has already been covered and what still needs to be done. A descriptive research on IS developer values and personality types was done to take note of how different individuals perceive power. This included research on the results of the Myers-Briggs Type Indicator (MBTI) as well as the DISC profiles.

A new link for further investigation was highlighted in this chapter. This is a link between a chosen ISD methodology and the control and reward structure. This was added on figure 2.3 (Role of designer values in IS development) adapted from Kumar and Bjorn-Anderson (1990). In order to research this further and also address questions on whether Systems Development Methodologies are empowering IS managers and enslaving systems developers; various research paradigms available to the researcher need to be explored. This will allow the researcher to choose a research paradigm that will best address the highlighted questions and in turn address the research objectives. This next chapter provides information on these research paradigms and their underlying characteristics. The chosen research paradigm, research method, data collection and analysis techniques associated with the chosen research paradigm will be highlighted.

Chapter 3

Research Paradigms

In this section the research prototypes, methods of investigation, data collection and data analysis techniques associated with various research paradigms will be explored. The main focus will be on the research prototypes, modus operandi, data collection and data analysis techniques that to be specifically utilised for the purpose of this research. The predominant objective of this investigation is a detailed study on the influence of power on the success and eventual outcome of Systems Development Methodologies.

This chapter commences with an introduction to research paradigm classification, brought to a conclusion by an analysis of the research studies including: the **positivistic, interpretive and critical social**. The selected research paradigms, those of investigative method, acquisition of data and appropriate data analysis techniques, will also be given prominence to.

3.1 Introduction

Research paradigms can be classified as **positivistic, interpretive or critical social** (Oates, 2006). Before proper research is conducted, the authentic research question to be addressed is established. The ambitions of the investigation and the distinctive traits of the research paradigm, inevitably prove invaluable to the selection of the quintessential paradigm to be utilised.

3.2 Positivistic, interpretive and critical social

In an analysis of the three predominant research paradigms, as listed in the resultant tables, (3.2), a summary of each paradigm is submitted. The first column of table 3.2 constitutes the specific research paradigms, specifically the: **positivistic, interpretive** and **critical-social**. The second column accommodates a clarification of each of the research paradigms. The third column illustrates the research procedures utilised for the specified research paradigm, whereas the fourth column highlights the data collection techniques for the specific research paradigm. The final column gives prominence to the data analysis methods for the specific research paradigm. Detailed descriptions of each paradigm can be established under the references highlighted.

Table 3.2: **Positivistic, interpretive, critical social research paradigms**

Research paradigm	Explanation of paradigm	Research methods	Data collection techniques	Data analysis methods
Positivistic	Positivism is sometimes referred to as 'scientific method' or 'science research' (Mackenzie and Knipe, 2006). It underlies the scientific method, reliability and validity of research can be tested. "It ensures people using scientific results that some standard of accuracy was employed, meaning any conclusions stemming from an analysis of the results can be *trusted* to be true". (McGregor and Murnane, 2010)	Experiments Survey Design and creation (Oates,2006) (Gephart,1999)	It tends to predominantly use quantitative approaches (methods) to data collection and analysis, though not necessarily exclusively. • Structured Interviews • Questionnaires • Documents that already exist before the research for example policy documents (Oates, 2006)	Quantitative analysis which includes Regression analysis and structural equation modelling.
Interpretive	The key focus of interpretive research paradigm is to search for patterns of meaning. This paradigm involves the social construction of reality. The unit of analysis is the meaning or symbolic act (Gephart, 1999). "Humans are seen as central to the research process, rather than isolated from it. They are not controlled and studied but are participants in the process, even instigating and benefiting from the research" (McGregor and Murnane, 2010:422).	Ethnography Case studies Action research (Oates, 2006)	• Interviews • Observation • Document analysis • Field Notes (Oates, 2006) • Archival records • Physical artefacts (Yin, 1989)	Qualitative data analysis such as • Grounded theorizing • Expansion analysis (Gephart, 1999) • Thematic analysis • Discourse analysis • Content analysis (Crabb and Chur-Hansen, 2009)
Critical social	"Critical social research in IS and computing is concerned with identifying power relations, conflicts and contradictions, and empowering people to eliminate them as sources of alienation and domination". (Oates, 2006)	Ethnography Case studies Action research Design and creation (Oates, 2006)	• Focus groups • Interviews • Observation According to Mackenzie and Knipe (2006), a diverse range of tools may be used with a particular need to avoid discrimination for example sexism, racism, and homophobia.	Depending on the research strategy used, this research paradigm can employ both qualitative and quantitative data analysis methods. For qualitative data analysis, discourse analysis can be used With respect to quantitative data analysis, frequency distributions may be

				employed. (Kane and Maxwell (2011) **Critical analysis** could also be employed according to McGregor and Murnane (2010). **Historical analysis**, **dialectical analysis** and **textual analysis** can also be used as data analysis methods in this paradigm. (Gephart, 1999).

It should be noted that each of the above mentioned research paradigms has its own flaws. Some researchers feel that, the positivistic research paradigm assumes that the only way to know is through the use of scientific methods. Humans are isolated from the research process, instead of being part of it, making the settings unnatural. Researchers and participants are to remain neutral which is not the norm in a natural setup. “Most research is contrived, happens in a laboratory or controlled setting, and is far removed from the real world of lived experiences” (McGregor and Murnane, 2010).

Results produced using the interpretive research paradigm, are not easily accepted as they are dependent on the personality, experience and techniques employed by the researcher. “Different interpretive researchers might apply different categorizing schemes with different scaling justifications, resulting in different outcomes” (Chen and Hirshheim, 2004). Judging the quality of research done using the critical social research paradigm can be challenging as it is difficult to tell whether there was a motive behind the researcher’s interpretations or not. In the name of being “critical” and trying to challenge the status quo, there is still a possibility that the researchers’ knowledge outcomes are influenced by political, organizational and historical factors. Knowledge outcomes are subject to change, since ‘the way things really are’ is constantly being changed or shaped by political, organizational or historical factors. In as much as it is crucial to emancipate the oppressed and make them aware of the source of their predicament, reality is never fully understood and is greatly influenced by power.

3.3 Chosen research paradigm

For the purposes of this research, the positivistic research paradigm was used. This is because the research question: Does power have any influence on the success of Systems Development Methodologies? was best addressed by this research paradigm. The research paradigm enabled the researcher to find out patterns and regularities between:

- Power and Systems Development Methodology use
- Power and success of Systems Development Methodologies

This means the researcher was able to generalize based on the patterns discovered regardless of the occasion or researcher's personal values and beliefs. The researcher was neutral and objective and acted as an impartial observer. This research paradigm facilitated the breaking down of the research question into smaller components, which were easily studied. In this case the researcher was able to reduce or break down the topic into the following components:

1. Systems Development Methodology use, that is, whether Systems Development Methodologies were being used intensively, widely, strictly, for how long, the type and number of Systems Development Methodologies being used in organizations.
2. Success of Systems Development Methodologies in terms of product, which is the developed system and process and which is the development process.
3. Level and type of power involved with Systems Development Methodologies.

3.4 Chosen research method

A survey was used as a research method because it allowed the researcher to obtain the same kinds of data from a large group of people in a standardized and systematic way. The survey was conducted in May 2013 and it was carried out in South Africa, so only organizations in South Africa were considered. The researcher focused on organisations that developed systems. This led to fifty organisations being targeted to be part of the study. These organisations were targeted electronically via their websites and also telephonically. Twenty organisations responded that they were willing to take part in the survey, translating to a response rate of 40%. Due to confidentiality reasons, the organisations' names could not be mentioned and have been replaced with numbers;

however the numbers of questionnaires received from each company are detailed in table 3.4.1 below:

Table 3.4.1 Number of questionnaires received from each organization

Organization number	Number of questionnaires received
1	6
2	10
3	13
4	6
5	7
6	11
7	14
8	9
9	12
10	8
11	4
12	1
13	13
14	8
15	5
16	9
17	4
18	2
19	8
20	3
Total	**153**

In an effort to get as many participants as possible, the researcher compiled a list of contact people per each organization that agreed to be part of the study. This served the purpose of acknowledging receipt of the questionnaires and distributing them in the organization. A package of standard questionnaires was then sent to contact persons in each potential organization. Postal method was used for survey data collection, though it was subject to postal delays. Some participants requested the electronic distribution of questionnaires via email and this was facilitated by the researcher. Personal administration of questionnaires was also used so as to speed up the distribution process. In order to keep track of questionnaires received and those that needed to be followed up on, the researcher created and maintained a survey protocol template Microsoft excel workbook. This workbook allowed the researcher to record received questionnaires and also indicate the date received. Outstanding questionnaires were also recorded and reminders were sent electronically to the organizations once a week. The survey targeted individuals with a special focus on Information Systems Managers and Developers.

3.5 Chosen data collection method

A Questionnaire was used as a data collection method because it allowed the researcher to gather responses in a standard and systematic way, thereby enhancing objectivity. Every respondent was presented with the same questions and measurements were done and analysed objectively. To ensure that the questionnaire enabled accurate capturing of the intended information, the researcher firstly tested it on a group of 4 peer researchers and incorporated changes, before proceeding to pilot test the questionnaire on a smaller subset of 15 respondents. This smaller subset was a company of choice from the potential listed organizations. The researcher employed a combination of open-ended and closed-ended questions. Open ended questions allowed the respondents room to fully express their views and closed ended questions narrowed down the choices for easier analysis purposes.

The research variables included in the questionnaire were the background information of the respondents in terms of the roles they assume at their workplaces. The highest qualification attained and personal experience in systems development (this was classified in years ranging from none to more than 10 years). The size of the respondents' organisation's IS department and also the business area of the organisations. The respondents also had to indicate whether they were using Systems Development Methodologies or not. If the respondents were using Systems Development Methodologies, they had to indicate the intensity, how widely they were using the Systems Development Methodologies, the strictness of use and their expected future use of Systems Development Methodologies. Respondents were also provided with a list of questions on Systems Development Methodologies offering support as a control technology and they had to indicate whether they totally agreed or not with the provided statements.

Respondents had to provide a description of the last project they were involved in including the size, duration, cost of the project and Systems Development Methodology used. Statements on the possible last systems development project outcome that the respondents were involved with were provided and the respondents had to select the one that best described their last systems development project outcome. Statements on Systems Development Methodologies providing quality of process and product were provided. Respondents had to indicate whether they totally agreed with the statements or not. Respondents were also asked to highlight their perceived individual power at the workplace and also indicate the use of power in their organisations. Respondents were

provided with a list of types of power that an individual can exercise or experience and they had to indicate the extent to which they leveraged or experienced these different types of power at work. Lastly they had to indicate the three sources of power most critical for them to leverage in the next five years. Table 3.5.1 below illustrates the link between data collected using the questionnaire and the research questions. Refer to appendix A for a sample questionnaire.

Table 3.5.1 Link between questionnaire data and research questions

Questionnaire data	Research question
• Background information (role, qualification, experience in systems development, size of IS department, business area, whether using Systems Development Methodologies or not?) • Intensity of use • Widely use • Vertical use • Strictness of use • Future use of Systems Development Methodologies	Question 1: Systems Development Methodology use – Describe the current situation with regards to Systems Development Methodology use in South Africa.
• Quality of product • Quality of process • Support as control technology • Last project description (size, duration, cost, systems development used) • Last project outcome	Question 2: Determine the effectiveness of Systems Development Methodologies in South Africa.
• Perceived individual power, • Use of power in organisations, • Types of power: individual exercise of power, • Types of power experienced, • Three sources of power most critical for individuals to leverage in the next 5 years.	Question 3: Determine the perception of developers with regards to Systems Development Methodologies and power.

3.6 Chosen data analysis techniques

The researcher then proceeded to look for patterns in the data using statistics so as to generalize to a larger population than the group she had targeted. IBM SPSS Statistics Version 21, Release 20.0.0 was used to analyse the data collected using questionnaires. Since the researcher wanted to analyse the relationships between components that is, power and the success of Systems Development Methodologies, regression analysis was the ideal tool to analyse the relationships between these variables.

Regression analysis indicated if the independent variable power had a significant relationship with the dependent variable. Using regression analysis, the researcher was also able to see the relative strength of the independent variable's effect on the dependent variable and with such findings the researcher was able to make predictions. Further tests performed included:

- Descriptive statistics – describing the development and application of methods to the collection, analysis and interpretation of questionnaire data.

- Factor analysis – A multivariate technique for identifying whether the correlations between a set of observed variables stem from their relationship to one or more latent variables in the data, each of which takes the form of a linear model (Field, 2005). "The research goal is simply to take a fairly large set of variables and reduce them to a smaller, more manageable number while retaining as much of the original variance as possible" (Conway and Huffcutt, 2003). The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy & Bartlett's test was used for this factor analysis. The KMO represents the ratio of the squared correlation between variables to the squared partial correlation between variables. Bartlett's test of sphericity is a test of the assumption. It effectively tests whether the diagonal elements of the variance - covariance matrix are equal (that is group variances are the same) and that the off diagonal elements are approximately zero (that is, the dependent variables are not correlated). (Field, 2005)

- Reliability test using the Cronbach's Alpha based on standardized item – It is a measure of reliability of a scale. (Field, 2005)

- T-test – It is a test using the t-statistic that establishes whether two means collected from the same sample (or related observations) differ significantly. (Field, 2005)

- Nonparametric correlation analysis – This analysis includes the Pearson's correlation (R) and the Spearman's correlation (rho). The Pearson's correlation denoted by coefficient r, is a standardised measure of the strength of relationship between two variables. The spearman's correlation denoted by coefficient rho, is a standardized measure of the strength of relationship between two variables that does not rely on the assumptions of a parametric test. (Field, 2005)

- Regression analysis – Is a way of predicting some kind of outcome from one or more predictor variables (simple regression). When an outcome is predicted from several predictor variables, it is called multiple regression. (Field, 2005)

Summary

In this chapter the positivistic, interpretive and critical social research paradigms were explored together with their associated research methods, data collection techniques and data analysis methods. The chosen research paradigm which is positivistic was explained as well as the research method (survey), data collection method (questionnaire) and the data analysis methods (factor analysis, nonparametric correlation analysis, reliability test, t-test and regression analysis). In the next chapter we are going to explore the survey results. The descriptive statistics results will be discussed first, followed by the results for factor analysis, reliability analysis, nonparametric correlations, t-test and regressions analysis.

Chapter 4

Results

This chapter will start off by outlining the results of the analysis on data collected using the questionnaire. Results of descriptive statistics will be recorded first followed by factor analysis results, reliability test results, nonparametric correlations results, t-test results and finally regression analysis results. Please note that a discussion of these results will follow in the next chapter.

4.1 Descriptive statistics

The questionnaire was organised into five sections namely section A to section E. Section A was designed to capture background information of the respondents such as the primary role assumed by respondents in systems development, the highest qualification obtained, personal experience in systems development, and number of people employed in the organisation's IS department at all locations. It also captured the core business area of the organisation and whether respondents were using any systems development methodologies or not.

Section B was designed to capture the extent of use of standard systems development methodologies, number of people using the systems development methodology(s) in an IS department, number of projects developed using the systems development methodology, strictness of use of the systems development methodology and also the expected future use of the systems development methodology.

Section C was designed to capture support as control technology offered by systems development methodologies.

Section D was designed to capture the outcome of the last project the respondents were involved with as well as the quality of the process and the quality of the product for the last project.

Section E was designed to capture power in organisations. This ranged from perceived individual power, whether power was centralized or not in the respondents' organisations, types of power exercised and experienced by respondents at work. This section also captured the three main sources of power that were rated most critical for respondents to leverage in the next 5 years. IBM SPSS Statistics Version 21, Release 20.0.0 was used to analyse the survey responses. The researcher received 153 completed questionnaires

from IT professionals. A summary of the questionnaire responses based on the role of the respondent are summarised in table 4.1 below:

Table 4.1 Roles of respondents in the survey

Role	Frequency	Valid Percent	Cumulative Percent
Chief Information Officer	5	3.3	3.3
Project Manager	31	20.3	23.5
Team Leader	29	19.0	42.5
Systems Architect	8	5.2	47.7
Business Analyst	15	9.8	57.5
Business Intelligence Analyst	11	7.2	64.7
Programmer	39	25.5	90.2
Other	15	9.8	100
Total	**153**	**100**	**100**

Based on the results recorded in table 4.1 it shows that the majority (25.5%) assumed the programmer / systems developer role followed by project managers (20.3%). The highest qualification attained by the respondents was also noted and it is summarised in table 4.2 below:

Table 4.2 Highest qualification attained by respondents in the survey

Highest qualification obtained	Frequency	Valid Percent	Cumulative Percent
Senior certificate (High School)	1	.7	.7
Certificate or diploma	16	10.5	11.1
University or technicon	42	27.5	38.6
Honors or Masters degree	94	61.4	100
Total	**153**	**100.0**	**100.0**

At least 61% of the respondents had obtained an Honours or Masters Degree. It can be noted that the majority of the respondents attained an Honours or Masters degree. The personal experience in systems development of respondents was also noted. This is recorded in table 4.3:

Table 4.3 Personal experience in systems development of respondents

Personal experience in systems development	Frequency	Valid Percent	Cumulative Percent
None	1	.7	.7
Less than 1 year	6	3.9	4.6
1 – 2 years	37	24.2	28.8
3 – 5 years	76	49.7	78.4
5 – 10 years	24	15.7	94.1
More than 10 years	9	5.9	100
Total	**153**	**100**	**100**

The majority of the respondents (49.7%) had at least 3 years experience in systems development. Only .7% had no experience in systems development. The size of the IS department in which the respondents were employed was also gathered. This information is shown in table 4.4 below:

Table 4.4 Size of respondents' IS department

Total number of people in IS department	**Frequency**	**Valid Percent**	**Cumulative Percent**
1 - 5	13	8.6	8.6
6 – 50	99	65.6	74.2
51 – 100	14	9.3	83.4
101 – 150	7	4.6	88.1
151 – 200	7	4.6	92.7
More than 200	11	7.3	100
No answer	2		
Total	**153**	**100**	**100**

The majority of the respondents (65.5%) worked in an organisation whose IS department had a total number of people ranging between 6 – 50 at all locations. The core business area for the organisations that respondents worked for were also noted and results are summarised in table 4.5:

Table 4.5 Core business areas of respondents' organisations

Core business area	Frequency	Valid Percent	Cumulative Percent
Manufacturing	6	3.9	3.9
Mining	11	7.2	11.1
Software development	66	43.1	54.2
Insurance	13	8.5	62.7
Retail	10	6.5	69.3
Banking and Finance	12	7.8	77.1
Education	20	13.1	90.2
Other	15	9.8	100
Total	**153**	**100**	**100**

The majority of respondents (43.1%) indicated that they were working for an organisation whose core business was software development. Respondents were also asked to indicate whether they were using systems development methodologies or not and the results are displayed in table 4.6 below:

Table 4.6 Respondents' answers with regards to using systems development methodologies

Using systems development methodologies	Frequency	Valid Percent	Cumulative Percent
No	5	3.3	3.3
Yes	148	96.7	100
Total	153	100	100

148 of the 153 respondents indicated that they were using systems development methodologies. This equates to 96.7%, which is very high considering that only 3.3% of the respondents were not using systems development methodologies. The type and intensity of use of systems development methodologies was also recorded and is summarised in table 4.7 below. This first column of table 4.7 indicates the type of systems development methodology and the second column indicated the classification of the systems development methodologies in terms of traditional systems development methodologies and agile systems development methodologies. The third column indicates the intensity of use of the systems development methodology. This column is further split into five more columns in order to rank the intensity of use of the systems development methodology. The ranking is from 1 to 5, with 1 being nominal use and 5 being intensive use of the systems development methodology.

Table 4.7 Intensity of use of systems development methodologies

Type of SDM	CLASSIFICATION of SDM	Intensity of use (Frequency)					Total
		Nominally				Intensively	
		1	2	3	4	5	
STRADIS (Structured Analysis, Design and Implementation of Information Systems)	Traditional	6	7	10	17	8	48
IE (Information Engineering)	Traditional	10	4	7	7	0	28
ETHICS (Effective Technical and Human Implementation of Computer-based Systems)	Traditional	14	3	9	12	8	46
SSM (Soft Systems Methodology)	Traditional	17	5	5	8	1	36
RAD (Rapid Application Development)	Agile	4	3	23	49	16	95
OOSE (Object Oriented Software Engineering by Jacobson)	Traditional	6	7	0	14	16	43
RUP (Rational Unified Process)	Traditional	8	9	0	1	1	19
XP (Extreme Programming)	Agile	8	1	20	20	7	56
SCRUM	Agile	2	5	15	39	29	90

Based on results recorded in table 4.7, it can be noted that most organisations are using a number of systems development methodologies ranging from traditional systems development methodologies to agile systems development methodologies. The highest intensity of use for systems development methodology is recorded for agile systems development methodologies especially SCRUM and RAD. The number of people using systems development methodologies in an organisation's IS department is recorded in table 4.8. This was a measurement of how widely people in IS departments are using systems development methodologies.

Table 4.8 Wide use of systems development methodologies

Number of people using SDMs in an IS department	Frequency	Valid Percent	Cumulative Percent
1 – 5	44	29.7	29.7
6 – 50	87	58.8	88.5
51 – 100	13	8.8	97.3
101 – 150	3	2.0	99.3
151 – 200	0	0	99.3
More than 200	1	.7	100
No answer	5		
Total	**153**	**100**	**100**

It can be deducted that systems development methodologies are being widely used, from the fact that most information systems development methodologies are being used by respondents whose organisations have 6-50 people employed in their IS departments, at all locations (refer to table 4.4). To also measure the wide use of systems development methodologies, the number of projects developed using systems development methodologies in organisations was noted. The results are summarised in table 4.9 below:

Table 4.9 Projects developed using systems development methodologies

Projects developed using SDMs	Frequency	Valid Percent	Cumulative Percent
1 - 10	94	63.5	63.5
11 - 20	44	29.7	93.2
21 - 30	4	2.7	95.9
More than 30	6	4.1	100
No answer	5		
Total	**153**	**100**	**100**

It can be noted that at most, 1 – 10 projects were being developed using systems development methodologies, at that specific moment during the time of the survey. The missing 5 can be attributed to the 5 respondents who indicated that they were not using any systems development methodologies (shown in table 4.6). The strictness of use of systems development methodologies was also noted. The results are indicated in table 4.10 and summarised in Figure 4.1:

Table 4.10 Strictness of use of systems development methodologies

Description of use of SDMs in an IS department	Frequency	Valid Percent	Cumulative Percent
A general guideline for all projects	60	40.5	40.5
Adapted on a project-to-project basis	67	45.3	85.8
A standard which is followed rigorously for all projects	21	14.2	
No answer (those not using SDMs)	5		
Total	**148**	**100**	**100**

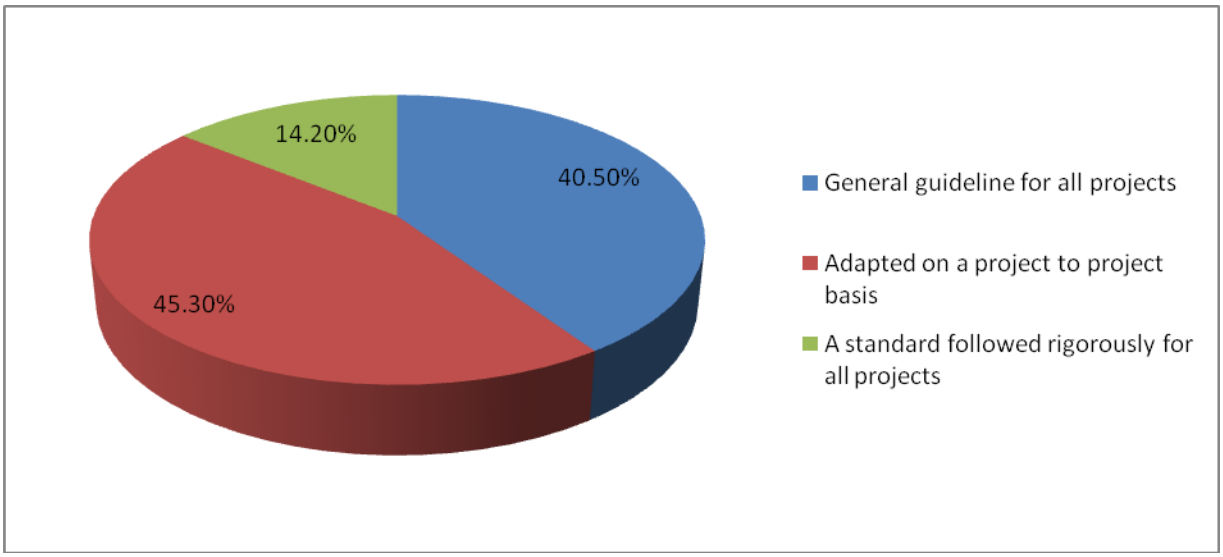

Figure 4.1 – strictness of use of systems development methodologies

Figure 4.1 shows that most (45.3%) organisations are adapting the use of systems development methodologies on a project to project basis (contingent use of systems development methodologies). With 40.5% using systems development methodologies as a guideline for all projects and only 14.2% are using systems development methodologies as a standard followed rigorously for all projects. Respondents were also asked to highlight their expectations with regards to the use of systems development methodologies in their IS departments in the next two years. The responses received are detailed in table 4.11 below:

Table 4.11 Future use of systems development methodologies

Expectations of future use of SDMs	**Frequency**	**Valid Percent**	**Cumulative Percent**
Make more use of our SDM	42	29.0	29.0
Replace our SDM	4	2.8	31.7
Supplement our SDM with other methodologies	23	15.9	47.6
Abandon the use of our SDM	1	.7	48.3
No change	75	51.7	100
No answer	8	0	
Total	**153**	**100**	**100**

The majority of the respondents expected no change in the next two years with regards to the use of their systems development methodologies. However 42 of the respondents felt they needed to make more use of their systems development methodologies in the future. A list of questions linked to systems development methodologies providing support as control technology was presented to respondents. They had to indicate whether they agreed with the statements or not. This aim was to determine whether systems development methodologies were providing support as control technology, support to decompose a system, and support to empower managers and enslaving systems developers. The response scale was ranked from 1 to 5, with 1 being “totally disagree” and 5 being “totally agree”. The frequencies of responses to the questions are captured in table 4.12:

Table 4.12 Responses to SDMs providing support as control technology

Questions asked	Responses (Frequency)				
	Totally disagree				Totally agree
	1	2	3	4	5
A systems development methodology helps to decompose the system to be developed in workable parts.	1	1	19	69	57
A systems development methodology helps to estimate the size of the system to be developed.	1	7	54	68	17
A systems development methodology helps to estimate the time and effort required for the development of a planned system.	1	4	46	75	21
A systems development methodology helps to plan systems development projects.	0	7	18	61	61
A systems development methodology helps managers gain control over team members.	3	12	28	79	23
A systems development methodology enslaves systems developers.	18	29	53	38	9
A systems development methodology helps in defining useful milestones for our systems development projects.	1	2	37	78	29
A systems development methodology helps to organize systems development projects.	0	13	29	62	43
A systems development methodology helps to keep our systems development projects under control.	0	19	28	59	41
A systems development methodology helps to estimate the project risks.	3	20	67	40	17
Overall, a systems development methodology helps us to manage our systems development projects.	1	7	20	67	52

69 of the respondents agreed that systems development methodologies helped decompose the system to be developed into workable parts. The majority of the respondents (68) also agreed that systems development methodologies helped estimate the time and effort required for the development of a planned system. The majority also agreed that systems development methodologies helped plan systems development projects. 78 respondents also highlighted that systems development methodologies helped in defining useful milestones for their systems development projects. From the results

recorded in table 4.12, it can be noted that the majority of the respondents agreed that systems development methodologies helped keep their systems development projects under control. Systems development methodologies also helped them to estimate project risks and overall, manage their systems development projects.

As indicated in the results in table 4.12, the majority of the respondents agreed that systems development methodologies were providing support as control technology. Support to decompose the system into workable parts was also being offered by systems development methodologies. The respondents also agreed that managers were using systems development methodologies to gain control over team members. However, the majority of the respondents neither agreed nor disagreed on systems development methodologies enslaving systems developers. Views on whether systems development methodologies are empowering managers and enslaving systems developers are summarised in figure 4.2 and figure 4.3 below:

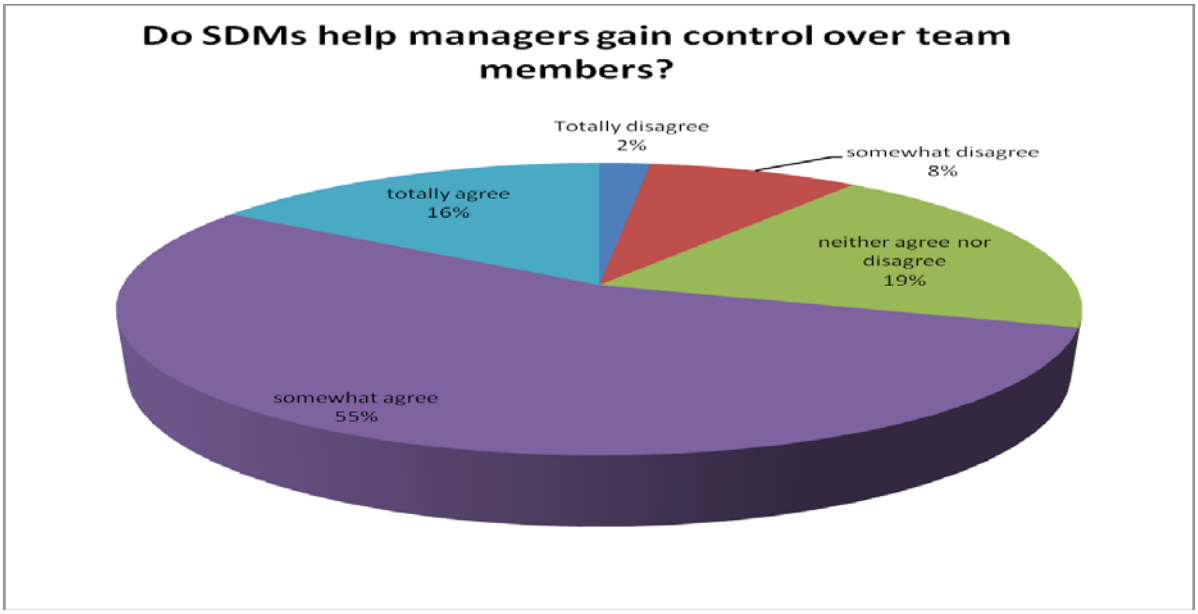

Figure 4.2 – responses to the question "Do SDMs help managers gain control over team members"

The majority of the users (55%) partially agreed that systems development methodologies were assisting managers in gaining control over team members. With a cumulative of 71% agreeing or totally agreeing to this effect. Only 19% of the respondents neither agreed nor disagreed to this effect.

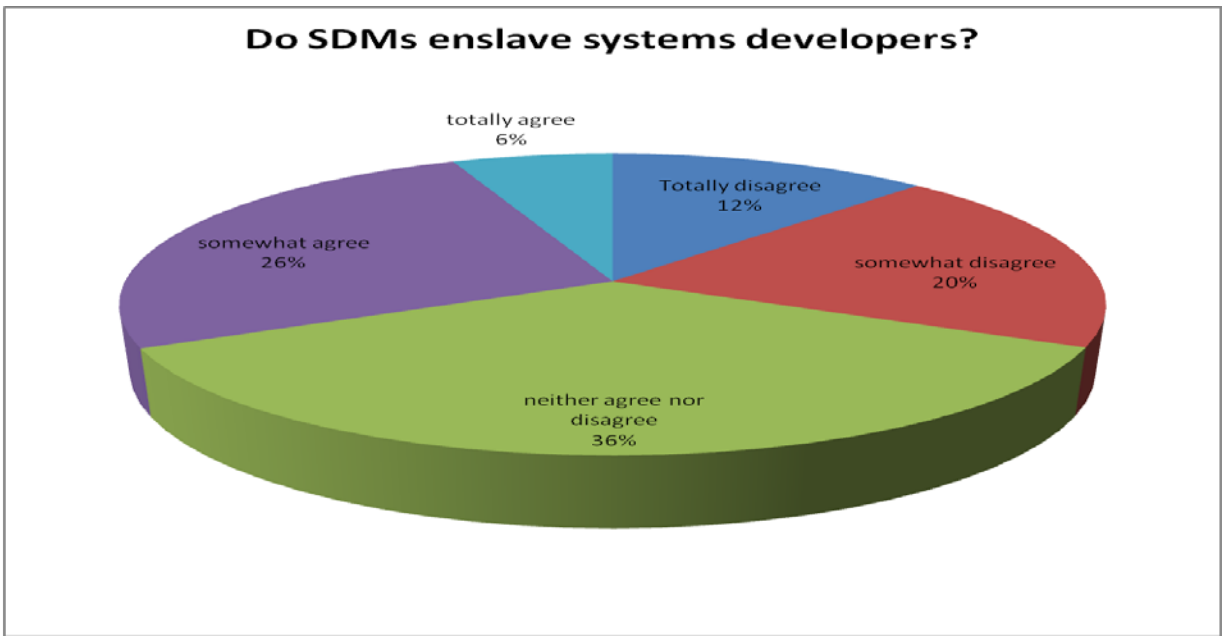

Figure 4.3 – responses to the question "Do SDMs enslave systems developers?"

From figure 4.3, it is clear that the majority of the group (36%) neither agreed nor disagreed that systems development methodologies were enslaving developers. 26% of the group partially agreed that systems development methodologies were enslaving systems developers. Overall, there was no clear feeling or perception on whether systems development methodologies enslave systems developers. Respondents were asked to rank their last project in terms of size, the results are shown in table 4.13 below:

Table 4.13 Last project size

Project size	Frequency	Valid Percent
Very small	15	9.4
Small	27	17
Medium	38	23.9
Large	49	30.8
Very large	24	15.1

The majority of the projects last worked on by respondents during the time of the survey were large as indicated in table 4.13. Only 15 had recently worked on very small projects. The duration of the projects was also noted and recorded in table 4.14. below:

Table 4.14 Last project duration

Project duration (months)	Frequency	Valid Percent
1	**14**	**8.8**
2	**8**	**5.0**
3	**24**	**15.1**
4	**15**	**9.4**
5	**4**	**2.5**
6	**36**	**22.6**
8	**8**	**5.0**
9	**2**	**1.3**
10	**4**	**2.5**
12	**18**	**11.3**
15	**3**	**1.9**
18	**7**	**4.4**
23	**1**	**.6**
24	**6**	**3.8**
36	**3**	**1.9**

It can be noted that the majority of the projects took 6 months to complete, with a few spanning over 2 years. The costs per latest project done could not be computed as some respondents were not too keen to disclose their project costs. However the systems development methodologies used in the last projects completed by the respondents were also highlighted. These are recorded in table 4.15:

Table 4.15 Systems development methodologies used in last project

Systems development methodology	Frequency	Valid Percent
Agile	2	1.3
SCRUM	31	20.4
Customised Prince 2	2	1.3
ETHICS	13	8.5
IE	2	1.3
In-house SDLC	2	1.3
KAM	3	2.0
None	4	2.6
OOSE	11	7.2
PRINCE 2	1	.7
RAD	41	26.8
RAP	1	.7
RUP	2	1.3

SSM	3	2.0
SSM/OOSE	1	.7
SSN	1	.7
STRADIS	15	9.8
TAM	2	1.3
TDD/BDD	4	2.6
Waterfall (iterated)	1	.7
XP	11	7.2

Most projects were developed using the agile systems development methodologies, with the RAD and SCRUM being the most used. Respondents were asked to highlight the outcome of the last systems development project they were involved with. Responses are noted in table 4.16 below:

Table 4.16 Systems development project outcomes

Project outcome	Frequency	Valid Percent
The project was canceled/terminated before completion.	7	4.4
The project was completed but not implemented.	7	4.4
The project was completed and implemented, but is not in use anymore.	9	5.7
The project was completed and implemented and is in use.	127	80

It is evident that most projects developed using systems development methodologies were completed, implemented and are in use. However 7 respondents indicated that their projects were canceled/terminated before completion, with 7 indicating that though their projects were completed they were not implemented. 9 respondents highlighted that their projects were completed and implemented but were not in use anymore. Respondents were presented with a number of questions to rank from 1 to 5, with 1 being “totally disagree” and 5 being “totally agree”. The questions were to measure the quality of the process provided by systems development methodologies. The responses are recorded in table 4.17:

Table 4.17 Quality of the process provided by systems development methodologies

Questions asked	Responses (Frequency)				
	Totally disagree				Totally agree
	1	2	3	4	5
The project was completed on schedule	10	8	60	57	13
The project was completed within the budget	3	14	67	56	9
The developed system satisfied all the stated requirements	9	3	48	71	20
The speed of developing the project was high	6	25	52	53	13
The productivity of developers involved with the project was high	2	10	57	72	10
The cost of the project is low when compared to the size and complexity of the system developed	8	23	63	40	15
The project achieved its goals	7	0	34	86	24
Overall, the project represents excellent work	7	1	28	80	35
Overall, the project was a success	7	3	27	77	37

Based on the results recorded in table 4.17, the majority of the respondents (60) neither agreed nor disagreed that their projects were completed on time. However 57 respondents agreed that the use of systems development methodologies assisted in completing projects on schedule. With regards to completion of systems development projects within the budget, the majority of the respondents (67) neither agreed nor disagreed and 56 respondents totally agreed. The majority of the respondents (71) agreed that the developed systems satisfied all the stated requirements. The speed of developing the project was indicated to be high as well as the productivity of developers involved with the project. The majority of the respondents (63) neither agreed nor disagreed that the cost of the project was low when compared to the size and complexity of the system developed. However the majority agreed that the project achieved its goals, overall the project represents excellent work and was a success.

The respondents were also given a list of questions to determine whether systems development methodologies were improving the quality of the product for systems developed projects. The responses were to be ranked from 1 – 5, 1 being totally disagree and 5 being totally agree. The responses are recorded in table 4.18:

Table 4.18 Quality of product provided by systems development methodologies

Questions asked	Responses (Frequency)				
	Totally disagree				Totally agree
	1	2	3	4	5
The functionality of the developed system is high	3	7	31	77	34
The reliability of the developed system is high	2	7	42	77	24
The maintainability of the developed system is high	4	16	56	58	17
The portability of the developed system is high	4	15	52	62	19
The efficiency of the developed system is high	3	6	32	85	26
The usability of the developed system is high	5	9	47	59	32
The developed system meets user needs	2	6	34	79	31
The documentation of the developed system is good	7	31	68	38	8
Overall the quality of the developed system is high	4	3	40	78	27
Overall, the users are satisfied with the developed system	3	6	36	76	30
Overall, the developed system is a success	6	6	20	88	30

Based on the results in table 4.18, the majority (77) of the respondents agreed that the functionlity of the developed system was high. They also agreed that the reliability of the developed system was high. The maintainability and portability of the developed system was also highlighted to be high. Most of the respondents agreed that the efficiency and usability of the developed system was high and the developed system met user needs. However the majority of the respondents (68) neither agreed nor disagreed that the documentation of the developed system was good. Overall, the majority of the respondents agreed that the quality of the developed system was high, the users were satisfied with the developed system and the developed system was a success.

The perceived individual power of respondents at their organisations was also gathered. The aim was to understand how powerful the respondents thought they were at their workplaces. The responses were ranked from 1 – 5, 1 being “not at all powerful” and 5 being “very powerful”. The results are in table 4.19 below:

Table 4.19 Perceived individual power

How powerful do you think you are at work?	Frequency	Valid Percent	Cumulative Percent
1 (Not at all powerful)	1	.7	.7
2	8	5.3	5.9
3	53	34.9	40.8
4	77	50.7	91.4
5 (Very powerful)	13	8.6	100
No answer	1		
Total	**153**	**100**	**100**

The majority of the respondents (77) felt they were powerful at their workplaces. With 13 respondents indicating that they were very powerful. Only 1 respondent felt he/she was not powerful at all. The respondents were also presented with a list of questions to determine the use of power within their organisations. The questions were ranked from 1 – 5, with 1 being “totally disagree” and 5 being “totally agree”. The responses are recorded in table 4.20 below:

Table 4.20 Use of power within organisations

Questions asked	Responses (Frequency)				
	Totally disagree				Totally agree
	1	2	3	4	5
My organisation empowers people at all levels	4	11	48	68	22
In my organization, power is concentrated in the hands of a few select individuals	10	30	40	49	24
My organization rewards leaders for empowering their people	9	16	62	59	7
My organization teaches leaders how to leverage their full power	11	10	63	56	13
Power is misused by top leaders in my organization	31	22	51	41	8

Based on responses recorded in table 4.20 it can be noted that the majority agreed that their organisations were empowering people at all levels. However when it came to power being concentrated in the hands of a few select individuals there was a small difference between those who agreed and those who neither agreed nor disagreed. The majority also neither agreed nor disagreed about their organisations rewarding leaders for empowering their people, there was a small difference with those who agreed to this question. The question of organisations teaching their leaders to leverage their full power and power being misused by top leaders in organisations had the majority neither agreeing nor disagreeing to that effect. There was however small differences in numbers with those who felt that power was being misused by top leaders in organisations. A significant number of respondents (31), however totally disagreed that top leaders were misusing power in their organisations.

Questions on types of power with particular reference to individual exercise of power at work were also presented to the respondents. They had to rank their responses on a scale 1 – 5, 1 being “very little extent” and 5 being “very great extent”. This was aimed at analysing how the respondents exercised these types of power to those below them at work. The results are recorded in table 4.21:

Table 4.21 Types of power: Individual exercise of power by respondents

Individual exercise of power	Responses (Frequency)				
	Very little extent				Very great extent
	1	2	3	4	5
The power of position (is the formal authority that derives from a person's title or position in a group or an organization)	8	10	59	64	12
The power of charisma (is the influence that is generated by a leader's style or persona)	1	4	33	80	35
The power of relationships (is the influence that leaders gain through their formal and informal networks both inside and outside of their organisations)	0	5	24	74	50
The power of information (is the control that is generated through the use of evidence deployed to make an argument)	2	1	17	69	64
The power of expertise (is the influence that comes from developing and communicating specialised knowledge / or the perception of knowledge)	0	0	9	44	100
The power to punish others	61	66	24	1	1
The power to reward others	5	5	33	84	26

The results recorded in table 4.21 reveal that the majority of the respondents exercised the power of position, power of charisma, power of relationships and power of information to a great extent. The power of expertise was being exercised to a very great extent by most respondents. However the majority highlighted that they were exercising the power to punish others to a little extent and very little extent. Unlike the power to punish others, the power to reward others was being exercised to a great extent. Respondents were also provided with the same set of questions, but this time, the types of power experienced at work were being analysed. This was aimed at finding out how these respondents were experiencing these types of power from those above them at the workplace. The results are recorded in table 4.22 below:

Table 4.22 Types of power experienced by respondents at the workplace

Types of power experienced	Responses (Frequency)				
	Very little extent				Very great extent
	1	2	3	4	5
The power of position (is the formal authority that derives from a person's title or position in a group or an organization)	5	5	36	66	41
The power of charisma (is the influence that is generated by a leader's style or persona)	1	4	45	70	33
The power of relationships (is the influence that leaders gain through their formal and informal networks both inside and outside of their organisations)	3	0	25	71	53
The power of information (is the control that is generated through the use of evidence deployed to make an argument)	0	2	13	67	71
The power of expertise (is the influence that comes from developing and communicating specialised knowledge / or the perception of knowledge)	0	1	13	49	90
The power to punish others	51	44	44	13	1
The power to reward others	6	14	52	70	11

The majority of the respondents highlighted that they were experiencing the power of position, power of charisma, power of relationships to a great extent from their superiors at work. The power of information and the power of expertise were being experienced to a very great extent. However, the power to punish others was being experienced to a very little extent with 44 respondents in-between, that is, neither experiencing it to great nor little extent. The power to reward others was being experienced to a great extent. When asked to highlight the three sources of power most critical to the respondents to leverage in the next 5 years, the following results recorded in table 4.23 were noted. Respondents had to rank their selection from 1 – 3 in terms of criticality, 1 being the most critical.

Table 4.23 Three sources of power most critical for respondents to leverage in the next 5 years

Sources of power	Responses (Frequency)		
	Most critical		
	1	2	3
The power of position (is the formal authority that derives from a person's title or position in a group or an organization)	23	6	17
The power of charisma (is the influence that is generated by a leader's style or persona)	10	10	26
The power of relationships (is the influence that leaders gain through their formal and informal networks both inside and outside of their organisations)	28	35	54
The power of information (is the control that is generated through the use of evidence deployed to make an argument)	18	54	30
The power of expertise (is the influence that comes from developing and communicating specialised knowledge / or the perception of knowledge)	70	46	20
The power to punish others	3	1	3
The power to reward others	1	1	3

- The power of expertise was the most critical source of power.
- The power of information was the second highest critical source of power.
- The power of relationships was the third highest critical source of power.

Based on the results recorded in table 4.23, it can be noted that though the majority of the respondents are not managers (as noted in table 4.1), they feel the "power of expertise" will give them leverage at work.

In this section the descriptive statistics results based on the data from the questionnaire were reported and analysed. The results ranged from the background of the respondents to the use of power at their workplaces including the three sources of power they feel are most critical for them to leverage in the next five years. In the next section, factor analysis results based on the questionnaire data are going to be reported.

4.2 Factor analysis

Factor analysis for structure detection - KMO and Bartlett's test was performed on the data. This was done to analyse the links that might exist in the data and to test if factor analysis could be beneficial. A value closer to 1 indicates that the patterns of correlation are relatively compact and that factor analysis will deliver clear and reliable results. The value should be at least 0.5 (Field, 2005). The categories of the KMO measure are as follows:

- Values between 0.5 and 0.7 are average;
- Values between 0.7 and 0.8 are good;
- Values between 0.8 and 0.9 are very good;
- Values above 0.9 are extremely good.

Bartlett's test is used to measure the null hypothesis so that the original correlation matrix is an identity matrix. For factor analysis to work, there has to be an affinity between variables, and if it is an identity matrix, then it entails that all correlation coefficients are 0. For this test to be significant ($p<0.001$) (Field, 2005).

Factor analysis was performed on systems development methodologies providing support as control technology (question 12), improving the quality of the process (question 15) and the quality of the product (question 16).

For support as control technology (question 12), the Kaiser-Meyer-Olkin Measure of sampling adequacy showed a very good value of .852 and the Bartlett's test showed a significant p value of .000 as indicated in table 4.24 below.

Table 4.24 KMO and Bartlett's Test: Support as control technology

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.852
Bartlett's Test of Sphericity	Approx. Chi-Square	328.661
	df	36
	Sig.	.000

Two components were extracted for question 12 using the principal component analysis extraction method. The results are recorded in the form of a pattern matrix in table 4.25:

Table 4.25 Pattern Matrix

	Component	
	1	2
Ques 12.9 (SDMs help keep projects under control)	.764	
Ques 12.11 (Overall, SDMs help manage development projects)	.745	
Ques 12.8 (SDMs help organize projects)	.739	
Ques 12.10 (SDMs help estimate project risks)	.663	-.365
Ques 12.3 (SDMs help estimate development time & effort required)	.626	
Ques 12.2 (SDMs help estimate the size of the system)	.503	
Ques 12.1 (SDMs help to decompose the system in workable parts)		.844
Ques 12.7 (SDMs help in defining useful milestones for projects)	.515	.519
Ques 12.4 (SDMs help to plan projects)	.379	.465

In table 4.25, component 1 represented support as control technology and component 2 represented support to decompose a system. The results show that component 1 is most highly correlated with question 12.9 (a systems development methodology helps to keep our systems development projects under control), question 12.11 (a systems development methodology helps us to manage our systems development projects), question 12.8 (a systems development methodology helps to organize systems development projects) and component 2 is most highly correlated with question 12.1 (a systems development methodology helps to decompose the system to be developed in workable parts).

For question 15 (quality of process), the Kaiser-Meyer-Olkin measure of sampling adequacy showed a very good value of .896 and the Bartlett's test showed a significant p value of .000. This is recorded in table 4.26 below:

Table 4.26 Quality of process

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.896
Bartlett's Test of Sphericity	Approx. Chi-Square	788.733
	df	36
	Sig.	.000

For question 15, only 1 component was extracted using the principal component analysis extraction method. This component 1 represented the quality of process. The results are recorded in a component matrix in table 4.27:

Table 4.27 Component Matrix

	Component
	1
Ques 15.8 (Overall, the project represents excellent work)	.864
Ques 15.9 (Overall, the project was a success)	.863
Ques 15.7 (The project achieved its goals)	.837
Ques 15.3 (The developed system satisfied all the stated requirements)	.834
Ques 15.5 (The productivity of developers involved with the project was high)	.811
Ques 15.4 (The speed of developing the project was high)	.709
Ques 15.1 (The project was completed on schedule)	.684
Ques 15.2 (The project was completed within the budget)	.613
Ques 15.6 (The cost of the project is low when compared to the size & complexity of the system developed)	.472

From the results recorded in table 4.27, it shows that component 1 (quality of process) is most highly correlated with question 15.8 (overall, the project represents excellent work), question 15.9 (overall, the project was a success), question 15.7 (the project achieved its goals), question 15.3 (the developed system satisfied all the stated requirements), question 15.5 (the productivity of developers involved with the project was high).

For question 16 (quality of product), the Kaiser-Meyer-Olkin measure of sampling adequacy showed an extremely good value of .920 and the Bartlett's test showed a significant p value of .000. This is recorded in table 4.28 below:

Table 4.28 Quality of product

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.920
Bartlett's Test of Sphericity	Approx. Chi-Square	871.105
	df	55
	Sig.	.000

For question 16, only 1 component was extracted using the principal component analysis extraction method. This component represented quality of the product. The results are recorded in a component matrix in table 4.29:

Table 4.29 Component Matrix

	Component
	1
Ques 16.9 (Overall, the quality of the developed system is high)	.860
Ques 16.11(Overall, the developed system is a success)	.839
Ques 16.5 (The efficiency of the developed system is high)	.832
Ques 16.10 (Overall, the users are satisfied with the developed system)	.823
Ques 16.7 (The developed system meets user needs)	.789
Ques 16.6 (The usability of the developed system is high)	.746
Ques 16.2 (The reliability of the developed system is high)	.733
Ques 16.1 (The functionality of the developed system is high)	.708
Ques 16.4 (The portability of the developed system is high)	.569
Ques 16.3 (The maintainability of the developed system is high)	.549
Ques 16.8 (The documentation of the developed system is good)	.388

Based on the results recorded in table 4.29, it shows that component 1 (quality of product) is high correlated with question 16.9 (overall, the quality of the developed system is high), question 16.11 (overall, the developed system is a success), question 16.5 (the efficiency of the developed system is high) and question 16.10 (overall, the users are satisfied with the developed system).

In this section factor analysis results for support as control technology, quality of the process and quality of the product were explored. In the next section, reliability test results for data gathered from the questionnaire are going to be reported.

4.3 Reliability tests

To test for reliability, the Cronbach's Alpha test was used. Cronbach's alpha measures the reliability of several items in a questionnaire. The reliability coefficient ranges from 0 to 1. A value closer to 1 indicates a higher reliability and as a rule of thumb a Cronbach's alpha of 0.8, or higher, is considered very reliable (Field, 2005). The test was done for question 12 (support as control technology), question 15 (quality of process) and question 16 (quality of product).

For question 12, the reliability statistics are recorded in table 4.30:

Table 4.30 Reliability Statistics – support as control technology

Cronbach's Alpha	Cronbach's Alpha Based on Standardised Items	N of Items
.808	.810	8

With reference to table 4.25 (Pattern matrix for question 12 – support as control technology), the factor analysis for this question resulted in 2 components. The reliability of the first component was tested and the following items were included:

- Question 12.9 (SDMs help keep projects under control)
- Question 12.11 (Overall, SDMs help manage development projects)
- Question 12.8 (SDMs help organize projects)
- Question 12.10 (SDMs help estimate project risks)
- Question 12.3 (SDMs help estimate development time & effort required)
- Question 12.2 (SDMs help estimate the size of the system)
- Question 12.7 (SDMs help in defining useful milestones for projects)
- Question 12.4 (SDMs help to plan projects)

The first 6 items listed above had high factor scores. The last 2 items, that is, question 12.7 (SDMs help in defining useful milestones for projects) and question 12.4 (SDMs help to plan projects) did not have high factors on any of the 2 components that resulted from the factor analysis; however these were included for reliability tests detailed below.

For question 12 the Cronbach's alpha was .808, this is a good reliability factor. The number of items included in the test was 8. The item total statistics per question were also recorded. These highlighted the value of Cronbach alpha if that specific item was deleted. The results are recorded in table 4.31:

Table 4.31 Item-Total Statistics: support as control technology

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Ques 12.2 (SDMs help estimate the size of system)	27.03	16.766	.395	.163	.804
Ques 12.3 (SDMs help estimate development time & effort required)	26.90	15.881	.571	.339	.781
Ques 12.4 (SDMs help to plan projects)	26.46	16.237	.440	.263	.798
Ques 12.7 (SDMs help in defining useful milestones for projects)	26.76	15.813	.591	.379	.778
Ques 12.8 (SDMs help organize projects)	26.74	14.864	.590	.377	.776
Ques 12.9 (SDMs help keep projects under control)	26.83	13.991	.671	.468	.762
Ques 12.10 (SDMs help estimate project risks)	27.33	16.347	.360	.162	.812
Ques 12.11 (Overall, SDMs help manage development projects)	26.56	15.221	.587	.371	.777

Based on the results in table 4.31, if question 12.10 (a systems development methodology helps to estimate project risks) is deleted, the Cronbach alpha value increases to .812. The researcher decided to keep question 12.10 since the difference of deleting it and keeping it was only .004. It also shows that if question 12.3 (a systems development methodology helps to estimate the time and effort required for the development of a planned system), question 12.4 (a systems development methodology helps to plan systems development projects), question 12.7 (a systems development methodology helps in defining useful milestones for our systems development projects), question 12.8 (a systems development methodology helps to organize systems development projects), question 12.9 (a systems development methodology helps to keep our systems development projects under control) and question 12.11 (overall, a systems development methodology helps us to manage our systems development projects) are deleted, the Cronbach alpha value would decrease. Based on the above findings, the final factor for support as control technology remained at .808.

Based on the results of the reliability tests for support as control technology, the final factor structure contains the following 8 items:

- Question 12.9 (SDMs help keep projects under control)
- Question 12.11 (Overall, SDMs help manage development projects)
- Question 12.8 (SDMs help organize projects)
- Question 12.10 (SDMs help estimate project risks)
- Question 12.3 (SDMs help estimate development time & effort required)

- Question 12.2 (SDMs help estimate the size of the system)
- Question 12.7 (SDMs help in defining useful milestones for projects)
- Question 12.4 (SDMs help to plan projects)

Question 12.1 (SDMs help decompose the system to be developed into workable parts) will be treated separately since it had a high factor under component 2.

For question 15 (quality of the process), the reliability statistics are recorded in table 4.32 below:

Table 4.32 Reliability Statistics: quality of the process

Cronbach's Alpha	Cronbach's Alpha Based on Standardised Items	N of Items
.896	.899	9

With reference to table 4.27 (Component matrix for question 15 – quality of the process), factor analysis for this question resulted in only 1 component. The reliability of this component was tested and the following 9 items were included:

- Question 15.8 (Overall, the project represents excellent work)
- Question 15.9 (Overall, the project was a success)
- Question 15.7 (The project achieved its goals)
- Question 15.3 (The developed system satisfied all the stated requirements)
- Question 15.5 (The productivity of developers involved with the project was high)
- Question 15.4 (The speed of developing the project was high)
- Question 15.1 (The project was completed on schedule)
- Question 15.2 (The project was completed within the budget)
- Question 15.6 (The cost of the project is low when compared to the size & complexity of the system developed)

The Cronbach alpha was .896 and this is a good reliability factor. The number of items tested was 9. The item-total statistics per each question was recorded. The value of Cronbach alpha if each of the items was deleted was also recorded. The results are displayed in table 4.33:

Table 4.33 Item-Total Statistics: quality of the process

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Ques 15.1 (project was completed on schedule)	28.43	29.981	.605	.455	.889
Ques 15.2 (project was completed within budget)	28.45	32.012	.518	.314	.894
Ques 15.3 (developed system satisfied all the stated requirements	28.19	28.549	.758	.666	.876
Ques 15.4 (The speed of developing the project was high)	28.50	29.524	.652	.538	.885
Ques 15.5 (productivity of developers was high)	28.28	30.328	.753	.584	.879
Ques 15.6 (cost of project is low when compared to the size & complexity of the system)	28.61	32.016	.384	.381	.907
Ques 15.7 (The project achieved its goals)	28.00	29.538	.747	.690	.878
Ques 15.8 (Overall, the project represents excellent work)	27.90	28.667	.792	.753	.874
Ques 15.9 (Overall, project was a success)	27.92	28.497	.779	.713	.875

Based on the results recorded in table 4.33, if question 15.6 (the cost of the project is low when compared to the size and complexity of the system developed) is deleted the value of the Cronbach alpha increases. The researcher decided to keep question 15.6, since the difference of keeping it and deleting it was only .011. It also shows that if all the others items are deleted, the value of the Cronbach alpha will decrease. These items are questions 15.1 (the project was completed on schedule), question 15.2 (the project was completed within the budget), question 15.3 (the developed system satisfied all the stated requirements), question 15.4 (the speed of developing the project was high), question 15.5 (the productivity of developers involved with the project was high), question 15.7 (the project achieved its goals), question 15.8 (overall, the project represents excellent work) and question 15.9 (overall, the project was a success). Based on the above findings, the final factor for quality of the process remained at .896. The final factor structure for quality of the process contains the following 9 items:

- Question 15.8 (Overall, the project represents excellent work)
- Question 15.9 (Overall, the project was a success)
- Question 15.7 (The project achieved its goals)
- Question 15.3 (The developed system satisfied all the stated requirements)
- Question 15.5 (The productivity of developers involved with the project was high)
- Question 15.4 (The speed of developing the project was high)
- Question 15.1 (The project was completed on schedule)
- Question 15.2 (The project was completed within the budget)
- Question 15.6 (The cost of the project is low when compared to the size & complexity of the system developed)

For question 16 (quality of product), the reliability statistics are recorded in table 4.34 below:

Table 4.34 Reliability Statistics: quality of the product

Cronbach's Alpha	Cronbach's Alpha Based on Standardised Items	N of Items
.902	.904	11

With reference to table 4.29 (Component matrix for question 16 – quality of the product), factor analysis for this question resulted in only 1 component. The reliability of this component was tested and the following items were included:

- Question 16.9 (Overall, the quality of the developed system is high)
- Question 16.11 (Overall, the developed system is a success)
- Question 16.5 (The efficiency of the developed system is high)
- Question 16.10 (Overall, the users are satisfied with the developed system)
- Question 16.7 (The developed system meets user needs)
- Question 16.6 (The usability of the developed system is high)
- Question 16.2 (The reliability of the developed system is high)
- Question 16.1 (The functionality of the developed system is high)
- Question 16.4 (The portability of the developed system is high)
- Question 16.3 (The maintainability of the developed system is high)
- Question 16.8 (The documentation of the developed system is good)

The Cronbach alpha was .902 and this is a good reliability factor. 11 items were tested. The item-total statistics per each item were recorded and the values of Cronbach alpha if each item was deleted were also recorded. The results are shown in table 4.35:

Table 4.35 Item-Total Statistics: quality of the product

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Ques 16.1 (The functionality of the developed system is high)	36.68	40.382	.642	.460	.893
Ques 16.2 (The reliability of the developed system is high)	36.79	40.733	.662	.499	.892
Ques 16.3 (The maintainability of the developed system is high)	37.10	41.753	.485	.351	.902
Ques 16.4 (The portability of the developed system is high)	37.03	41.540	.503	.367	.901
Ques 16.5 (The efficiency of the developed system is high)	36.72	39.701	.760	.657	.887
Ques 16.6 (The usability of the developed system is high)	36.85	39.348	.674	.512	.891
Ques 16.7 (The developed system meets user needs)	36.68	40.258	.703	.610	.890
Ques 16.8 (The documentation of the developed system is good)	37.48	43.454	.335	.164	.911
Ques 16.9 (Overall, the quality of the developed system is high)	36.75	39.188	.794	.724	.885
Ques 16.10 (Overall, the users are satisfied with the developed system)	36.73	39.360	.759	.620	.887
Ques 16.11 (Overall, the developed system is a success)	36.68	38.690	.775	.669	.885

Based on the results recorded in table 4.35, if question 16.3 (the maintainability of the developed system is high) is deleted, the value of Cronbach alpha remains the same. If question 16.8 (the documentation of the developed system is good) is deleted, the value of Cronbach alpha would increase. The researcher decided to keep question 16.8 since the difference of deleting it and keeping it was only .009. However if questions 16.1 (the functionality of the developed system is high), 16.2 (the reliability of the developed system is high), 16.5 (the efficiency of the developed system is high), 16.6 (the usability of the developed system is high), 16.7 (the developed system meets user needs), 16.9 (overall, the quality of the developed system is high), 16.10 (overall, the users are satisfied with the developed system) and 16.11 (overall, the developed system is a success) were deleted, the value of the Cronbach alpha would decrease. If question 16.4 (the portability of the developed system is high) is deleted, the Cronbach alpha value would not significantly change. Based on the above findings, the final factor for quality of the product remained at .902. The final factor structure for quality of the product contains the following 11 items:

- Question 16.9 (Overall, the quality of the developed system is high)
- Question 16.11 (Overall, the developed system is a success)
- Question 16.5 (The efficiency of the developed system is high)
- Question 16.10 (Overall, the users are satisfied with the developed system)
- Question 16.7 (The developed system meets user needs)
- Question 16.6 (The usability of the developed system is high)

- Question 16.2 (The reliability of the developed system is high)
- Question 16.1 (The functionality of the developed system is high)
- Question 16.4 (The portability of the developed system is high)
- Question 16.3 (The maintainability of the developed system is high)
- Question 16.8 (The documentation of the developed system is good)

In this section, the results for the reliability tests for support as control technology, quality of the process and quality of the product were reported. In the next section, the results of the nonparametric correlations are going to be reported.

4.4 Nonparametric correlations

For non-parametric correlations, the Spearman's rho was used to analyse associations between the data. The closer the value is to 1, the stronger the correlation (Field, 2005). The following categories will be used to describe the strength of the correlation:

- Values between 0.0 and 0.2 indicate a weak relationship;
- Values between 0.2 and 0.4 indicate a moderate relationship;
- Values between 0.4 and 0.6 indicate a strong relationship;
- Values between 0.6 and 1 indicate a very strong relationship

When the analysis was done, all significant correlations between questions were indicated by a superscript * in the results table. These were selected for reporting.

Specific significant correlations with question 12.5 (a systems development methodology helps managers to gain control over team members) are recorded in table 4.36 below:

Table 4.36 – Question 12.5 (SDMs helping managers to gain control) correlations

	Spearman's rho : Q 12.5 (SDMs helping managers to gain control)	
	Correlation coefficient	Strength of correlation
Q 14 (Project outcome)	-.170*	Negative weak relationship
Q 7.2 (IE-Traditional SDM)	.562*	Positive strong relationship
Q 7.3 (ETHICS- Traditional SDM)	.619*	Positive very strong relationship
Q11 (Future use of SDMs)	.264*	Positive moderate relationship
Q 18.1(Empowerment)	-.228*	Negative moderate relationship
Q 18.2 (power centralization)	.329*	Positive moderate relationship

Results recorded in table 4.36 show that there were significant correlations between question 12.5 (a systems development methodology helps managers to gain control over team members) and project outcome, traditional systems development methodologies (specifically Information Engineering and ETHICS), future use of systems development methodologies, organisations empowering people at all levels and power being centralized or concentrated in the hands of a select few.

Specific significant correlations with question 12.6 (a systems development methodology enslaves systems developers) are recorded in table 4.37 below:

Table 4.37 – Question 12.6 (SDMs enslaving systems developers) correlations

	Spearman's rho: Q 12.6 (SDMs enslaving systems developers)	
	Correlation coefficient	Strength of correlation
Q 18.5 (misuse of power)	.218*	Positive moderate relationship
Quality of product	-.251*	Negative moderate relationship

Based on the results from table 4.37, it shows that question 12.6 (a systems development methodology enslaves systems developers) has a positive correlation with question 18.5 (power is misused by top leaders in my organization) and a negative correlation with the quality of product of systems development methodologies. Specific significant correlations for question 7.1 (STRADIS) which represents traditional systems development methodologies are recorded in table 4.38 below:

Table 4.38 - Question 7.1 (Traditional SDMs – STRADIS) correlations

	Spearman's rho : Q 7.1 (Traditional SDMs - STRADIS)	
	Correlation coefficient	Strength of correlation
Q19.2 (Power of charisma)	.322*	Positive moderate relationship
Q20.1 (Power of position)	.410*	Positive strong relationship
Q20.6 (Power to punish others)	.321*	Positive moderate relationship
Q18.2 (power centralization)	.352*	Positive moderate relationship
Support control technology	.301*	Positive moderate relationship

The results from table 4.38 indicate that the traditional systems development methodologies represented by question 7.1 (STRADIS) have a positive correlation with question 19.2 (the power of charisma), question 20.1 (the power of position), question 20.6

(the power to punish others), question 18.2 (in my organization, power is concentrated in the hands of few select individuals) and support as control technology offered by systems development methodologies. Specific significant correlations for question 7.9 (SCRUM) which represents agile systems development methodologies are recorded in table 4.39 below:

Table 4.39 – Question 7.9 (Agile SDMs - SCRUM) correlations

	Spearman's rho: Q 7.9 (Agile SDMs- scrum)	
	Correlation coefficient	Strength of correlation
Q 19.4 (power of information)	.336*	Positive moderate relationship

The results from table 4.39 indicate that question 7.9 (SCRUM) has a positive correlation with question 19.4 (the power of information). Specific significant correlations for question 9 (wide use of systems development methodologies) are recorded in table 4.40 below:

Table 4.40 – question 9 (Widely use of SDMs) correlations

	Spearman's rho: Q9 (Wide use of SDMs)	
	Correlation coefficient	Strength of correlation
Q20.5 (Power experienced -power of expertise)	.216*	Positive moderate relationship
Q19.4 (Power exercise - power of information)	.271*	Positive moderate relationship
Quality of process	.215*	Positive moderate relationship
Support as control technology	.228*	Positive moderate relationship

Based on the results recorded in table 4.40, it shows that question 9 (widely use of systems development methodologies) has a positive correlation with question 20.5 (Types of power experienced - the power of expertise), question 19.4 (Individual exercise of power - the power of information), quality of process and support as control technology offered by systems development methodologies. Specific significant correlations for question 11 (future use of systems development methodologies) are recorded in table 4.41 below:

Table 4.41 – Question 11 (Expected future use of SDMs) correlations

	Spearman's rho: Q11 (expected future use)	
	Correlation coefficient	Strength of correlation
Q19.5 (Power exercise – power of expertise)	.280*	Positive moderate relationship
Q20.1 (Power experienced – power of position)	.235*	Positive moderate relationship

The results in table 4.41 indicate that question 11 (future use of systems development methodologies) has a positive correlation with question 19.5 (the power of expertise) and question 20.1 (the power of position). The specific significant correlations for question 18.5 (power is misused by top leaders in my organization) are recorded in table 4.42 below:

Table 4.42 – Question 18.5 (Misuse of power in organisations) correlations

	Spearman's rho: Q18.5 (misuse of power in organisations)	
	Correlation coefficient	Strength of correlation
Q19.1 (Power exercise – power of position)	.238*	Positive moderate relationship

The results recorded in table 4.42 show that question 18.5 (power is misused by top leaders in my organization) has a positive correlation with question 19.1 (the power of position).

In this section, the nonparametric correlation results on systems development methodologies helping managers gain control over team members, systems development methodologies enslaving of systems developers, traditional and agile systems development methodologies, wide use and future use of systems development methodologies, expected future use of systems development and the misuse of power in organisations were reported on. In the next section, t-tests and regression analysis results on data gathered from the questionnaire will be explored.

4.5 T-tests

To test the hypothesis of no difference between two variables, the paired-samples t-test procedure was used. A confidence interval for the average difference was set at 95%. For this test, values less than .05 are considered significant. The sig. (2-tailed) column was used to check all significant values. The first t-test group was to determine if there was a significant difference between the responses of respondents that indicated that they are using traditional systems development methodologies and those that are not using it. All sig. (2-tailed) values less than .05 were extracted and the results are recorded in table 4.43 below:

Table 4.43 Independent Samples Test for t-test group: traditional systems development methodologies group

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Quality of process	Equal variances assumed	6.247	.014	-2.265	149	.025	-.25200	.11128	-.47189	-.03211
	Equal variances not assumed			-2.466	146.043	.015	-.25200	.10218	-.45395	-.05005
Ques 12.1 (SDMs helps to decompose)	Equal variances assumed	2.113	.148	2.203	145	.029	.276	.125	.028	.524
	Equal variances not assumed			2.163	109.724	.033	.276	.128	.023	.529
Ques 12.6 (SDMs enslaves systems developers)	Equal variances assumed	7.585	.007	-2.111	145	.036	-.387	.183	-.750	-.025
	Equal variances not assumed			-2.266	140.198	.025	-.387	.171	-.725	-.049

The means and effect sizes of those using traditional systems development methodologies and those not using traditional systems development methodologies were computed.

- Values between 0.0 and 0.15 indicate a small effect;
- Values between 0.15 and 0.35 indicate a medium effect;
- Values larger than 0.35 indicate a large effect.

These are displayed in table 4.43a:

Table 4.43a: Mean values and effect sizes for traditional SDMs

Questions	Using traditional systems development methodologies (mean values)	**Not** using traditional systems development methodologies (mean values)	Effect size	Interpretation
Quality of process	3.4	3.7	0.32	Medium effect
Ques 12.1 (SDMs help to decompose a system)	4.3	4.1	0.36	Large effect
Ques 12.6 (SDMs enslave systems developers)	2.8	3.2	0.33	Medium effect

Based on the results from recorded in tables 4.43 and 4.43a, it shows that for those using traditional systems development methodologies, they experience the quality of the process offered by systems development methodologies to a lesser extent as opposed to those not using traditional systems development methodologies. This may be attributed to the process centric and standardised nature of traditional systems development methodologies. The results showed a medium effect between quality of the process and, using or not using traditional systems development methodologies. The view of systems development methodologies helping to decompose a system to be developed in workable parts is experienced to a large extent by those using traditional systems development methodologies. This may be attributed to the pre-planned step by step approach followed by traditional systems development methodologies. The results showed a large effect between a systems development methodology helping to decompose the system to be developed in workable parts and, using or not using traditional systems development methodologies. The results also showed that those not using traditional systems development methodologies perceived the “enslavement” of systems development methodology to a greater extent as compared to those using traditional systems development methodologies. This may be attributed to the different qualifications and personality types of the respondents. Some might feel that they need the guidance offered by traditional systems development methodologies and hence they will not feel enslaved by their use, whereas some who are experienced might feel they need the liberty to be creative and find the use of systems development methodologies limiting them. However the results showed a medium effect between systems development methodologies enslaving systems developers and, using or not using traditional systems development methodologies.

The second t-test group was to determine if there was a significant difference between the responses of respondents that indicated that they are using agile systems development methodologies and those that are not using it. For this test, values less than .05 are considered significant. The sig. (2-tailed) column was used to check all significant values. All sig. (2-tailed) values less than .05 were extracted and the results are recorded in table 4.44 below:

Table 4.44 Independent Samples Test for t-test group: Agile systems development methodologies

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Ques 19.1	Equal variances assumed	2.835	.094	-2.374	151	.019	-.586	.247	-1.073	-.098
	Equal variances not assumed			-2.956	19.685	.008	-.586	.198	-.999	-.172
Ques 20.5	Equal variances assumed	16.165	.000	-2.290	151	.023	-.417	.182	-.778	-.057
	Equal variances not assumed			-2.869	19.780	.010	-.417	.146	-.721	-.114
Ques 12.5	Equal variances assumed	1.510	.221	-1.698	143	.092	-.496	.292	-1.074	.081
	Equal variances not assumed			-2.312	11.930	.039	-.496	.215	-.964	-.028

The means and effect sizes of those using agile systems development methodologies and those not using agile systems development methodologies were computed.

- Values between 0.0 and 0.15 indicate a small effect;
- Values between 0.15 and 0.35 indicate a medium effect;
- Values larger than 0.35 indicate a large effect.

These are displayed in table 4.44a:

Table 4.44a: Mean values and effect sizes for Agile SDMs

Questions	Using agile systems development methodologies (mean values)	**Not** using agile systems development methodologies (mean values)	Effect size	Interpretation
Ques 19.1 (power exercised – power of position)	3.4	3.9	0.63	Large
Ques 20.5 (power experienced – power of expertise)	4.5	4.9	0.61	Large
Ques 12.5 (SDMs help managers gain control)	3.7	4.2	0.55	Large

Based on the results in tables 4.44 and 4.44a, it shows that those using agile systems development methodologies exercise the power of position to a lesser extent than those not using agile systems development methodologies. This may be attributed to managers are viewed as facilitators when using agile systems development methodologies. The results indicated a large effect between type of power exercised – power of position and, using and not agile using systems development methodologies. The results show that the type of power experienced – power of expertise is higher for those not using agile systems development methodologies as compared to those using agile systems development methodologies. This may be attributed to the constant need to have specialized skills by those not using agile systems development methodologies. The results also show that those not using agile systems development methodologies, perceive to a greater extent that systems development methodologies help managers gain control over team members as compared to those using agile systems development methodologies. This may also be attributed to the command and control nature of other systems development methodologies which are not agile systems development methodologies. The results showed a large effect in this regard.

The third t-test group was for the roles assumed by respondents at the workplace. These roles were split into 2 distinct categories that is, manager and other. The manager category consisted on chief information officer, project manager and team leader titles. The other category consisted of systems architect, business analyst, business intelligence analyst and programmer titles. For this test, values less than .05 are considered significant. The sig. (2-tailed) column was used to check all significant values. All sig. (2-

tailed) values less than .05 were extracted and the results are recorded in table 4.45 below:

Table 4.45 Independent Samples Test for t-test group: role of respondent at work

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Ques 19.1 (type of power exercised – power of position)	Equal variances assumed	1.980	.161	2.094	151	.038	.312	.149	.018	.606
	Equal variances not assumed			2.155	149.104	.033	.312	.145	.026	.598
Ques 19.2 (type of power exercised- power of charisma)	Equal variances assumed	.339	.561	2.301	151	.023	.290	.126	.041	.538
	Equal variances not assumed			2.331	143.902	.021	.290	.124	.044	.535
Ques 19.7 (type of power exercised – power to reward)	Equal variances assumed	9.318	.003	3.595	151	.000	.497	.138	.224	.771
	Equal variances not assumed			3.716	149.985	.000	.497	.134	.233	.762
Ques 20.7 (type of power experienced – power to reward others)	Equal variances assumed	3.378	.068	3.367	151	.001	.480	.143	.199	.762
	Equal variances not assumed			3.495	150.550	.001	.480	.137	.209	.752
Ques 12.5 (SDMs helps managers gain control)	Equal variances assumed	5.009	.027	2.279	143	.024	.339	.149	.045	.633
	Equal variances not assumed			2.329	138.186	.021	.339	.146	.051	.627

The means and effect sizes for the role of respondent at work that is managers and others were computed.

- Values between 0.0 and 0.15 indicate a small effect;
- Values between 0.15 and 0.35 indicate a medium effect;
- Values larger than 0.35 indicate a large effect.

These are displayed in table 4.45a:

Table 4.45a: Mean values and effect sizes for the role of respondent at work

Questions	Role : Manager (mean values)	Role: Other (mean values)	Effect size	Interpretation
Ques 19.1 (type of power exercised – power of position)	3.6	3.3	0.32	Medium
Ques 19.2 (type of power exercised- power of charisma)	4.1	3.8	0.36	Large
Ques 19.7 (type of power exercised – power to reward)	4.1	3.6	0.54	Large
Ques 20.7 (type of power experienced – power to reward others)	3.7	3.2	0.50	Large
Ques 12.5 (SDMs helps managers gain control)	3.9	3.6	0.36	Large

Based on the results in table 4.45 and 4.45a, it shows that managers exercise the power of position more than non-managers. This may be attributed to the power embedded in their management role at work. However the effect between the use of the power of position and being a manager or not at work was medium. The results also show that managers exercise the power of charisma at work more than non-managers. This may be attributed to the need by managers to generate influence to non-managers at work. The effect between the use of the power of charisma and, managers and others at work was large. The power to reward others exercised by managers at work was high as compared to that of non-managers. This may be attributed to the need to constantly motivate others at work by managers. The effect between the exercise of the power to reward others at work and, being a manager and non-manager was large. The results also showed that managers were experiencing the power to reward others from their superiors more than the non-managers. This may be attributed to the role assumed, organizational reward structures and recognition awarded to people in management positions. The effect between types of power experienced – power to rewards others and, being a manager and non-manager was large. The results also show that systems development methodologies are helping managers more to gain control over team members as compared to non-managers. This may be attributed to the guidance and benefits derived from the use of systems development methodologies. The effect between system development methodologies helping managers gain control over team members and, being a manager and non-manager was large.

4.6 Regression analysis

The stepwise method was used to model the value of a dependent scale variable on its relationship to one or more predictors. This method is useful for automatically selecting the "best" variables to use for analysis, when one has a number of predictors. At each step, the term variable whose addition causes the largest statistically significant change to the value of adjusted R square is added to the model. The final model should only include important significant predictors (Field, 2005).

This analysis was done specifically to analyse the relationship between dependent variables - questions 12.5 (a systems development methodology helps managers gain control over team members) and question 12.6 (a systems development methodology enslaves systems developers) and their respective predictors. The first test was done for question 12.5 (a systems development methodology helps managers gain control over team members). The model summary results are recorded in table 4.46 below:

Table 4.46 Model Summary for dependent variable question 12.5 (SDMs helping managers gain control over team members)

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.789[a]	.622	.580	.953
2	.911[b]	.830	.788	.678

a. Predictors: (Constant), Ques 18.4 (leaders leveraging their full power)

b. Predictors: (Constant), Ques 18.4 (leaders leveraging their full power), Ques 7.2 (Traditional SDMs – Information Engineeering)

Results recorded in table 4.46 indicate that for model 1 the value of adjusted R square for question 12.5 (SDMs helping managers gain control over team members) and model 1 is 58%. As the second predictor (question 7.2 – traditional systems development methodology: Information Engineering) is added to the first predictor (question 18.4), the value of adjusted R square for question 12.5 increases to 78%. The percentage variance for model 1 and model 2 is .208 (.788 - .580 =.208). Model 2 will be used from this point onwards. The coefficients for dependent variable question 12.5 and model 2 are recorded in table 4.47:

Table 4.47 Coefficients for dependent variable question 12.5 (SDMs helping managers gain control over team members)

Model		Unstandardised Coefficients		Standardised Coefficients	t	Sig.
		B	Std. Error	Beta		
2	(Constant)	-.690	.597		-1.155	.281
	Ques 18.4 (leaders leveraging full power)	1.021	.190	.783	5.371	.001
	Ques 7.2 (traditional SDMs – Information Engineering)	.556	.178	.456	3.128	.014

a. Dependent Variable: Ques 12.5 (SDMs helping managers gain control over team members)

The results displayed in table 4.47 show standardised coefficients Beta of .783 and .456 for model 2 questions respectively. The sig. values for both questions in model 2 are .001 and .014; all these are below .05 hence significant.

The second test was done for the dependent variable - question 12.6 (a systems development methodology enslaves systems developers), the model summary is recorded in table 4.48 below:

Table 4.48 Model Summary for dependent variable question 12.6 (SDMs enslave systems developers)

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.687[a]	.472	.413	.935
2	.864[b]	.747	.683	.687
3	.933[c]	.871	.816	.524

a. Predictors: (Constant), Ques 20.3 (types of power experienced – power of relationships)

b. Predictors: (Constant), Ques 20.3 (types of power experienced – power of relationships), Ques 19.1 (individual exercise of power – power of position)

c. Predictors: (Constant), Ques 20.3 (types of power experienced – power of relationships) , Ques 19.1 (individual exercise of power – power of position), Ques 20.6 (types of power experienced – power to punish others)

Based on the results recorded in table 4.48, model 1 is made up of predictor question 20.3 (the power of relationships). Model 2 is made up of predictors question 20.3 (the power of relationships) and question 19.1(the power of position). Model 3 is made up of predictors question 20.3 (power of relationships), question 19.1 (power of position) and question 20.6 (the power to punish others). The value of adjusted R square for model 1 is 41.3%, model 2 is 68.3% and model 3 is 81.6%. As the predictors are added, the value of adjusted R square also increases. Model 3 will be used from this point onwards.

Table 4.49 Coefficients of dependent variable question 12.6 (SDMs enslaving systems developers)

Model		Unstandardised Coefficients		Standardised Coefficients	t	Sig.
		B	Std. Error	Beta		
3	(Constant)	3.369	.615		5.477	.001
	Ques 20.3 (types of power experienced – power of relationships)	-.648	.128	-.690	-5.064	.001
	Ques 19.1 (individual exercise of power – power of position)	.950	.217	1.000	4.382	.003
	Ques 20.6 (types of power experienced – power to punish others)	-.545	.210	-.593	-2.594	.036

a. Dependent Variable: Ques 12.6 (SDMs enslaving systems developers)

Based on the results recorded in table 4.49, model 3 sig. values for all the 3 predictors are less than .05 hence significant.

4.7 Conclusion

In this chapter the results of the descriptive statistics, factor analysis, reliability tests, nonparametric correlations, t-test and regression analysis were highlighted. Based on these results, the research findings and contributions are now going to be discussed. This is going to be done in the next chapter.

Chapter 5

Discussion and conclusion

The main aim of this research was to study the influence of power on the success of systems development methodologies. In order to effectively reach this aim the following research objectives were highlighted in chapter 1:

1. Systems development methodology use – Describe the current situation with regards to systems development methodology use in South Africa.
2. Determine the effectiveness of systems development methodologies in South Africa.
3. Determine the perception of developers with regards to systems development methodologies and power.
4. Determine relationships between:

a) Power and systems development methodology use.

b) Power and success of systems development methodologies.

In this chapter, the above stated objectives will be addressed.

5.1 Findings and contributions

In order to address our research objectives a survey was performed during May 2013. Responses were received from 153 respondents from 20 organisations in South Africa. The respondents to the survey were IT professionals with roles at the workplace ranging from the Chief Information Officer to the programmer. The majority (26%) assumed the programmer / systems developer role followed by project managers (20%). At least 61% of the respondents had obtained an Honours or Masters Degree. 50% of the respondents had 3 – 5 years personal experience in systems development, only .7% had no experience in systems development. The majority of the respondents (66%) worked in an organisation whose I.S. department had a total number of people ranging from 6 – 50 at all locations. 43% were working for an organisation whose core business was software development and 97% of all respondents were using systems development methodologies. This means that the target population was fit as a representative sample for this research survey and in obtaining the much needed knowledge on the topic.

Research objective 1: Systems development methodology use – Describe the current situation with regards to systems development methodology use in South Africa.

We will address research objective 1 by discussing the following topics:

- What systems development methodologies are used?
- How intensively are systems development methodologies used?
- How widely are systems development methodologies used?
- How strictly are systems development methodologies used?
- What are the respondents' views on the future use of systems development methodologies?

Most respondents (97%) indicated that they were using systems development methodologies, ranging from the traditional systems development methodologies to the agile systems development methodologies. The research showed that they mostly used systems development methodology was Rapid Application Development (RAD) which is an agile systems development methodology. Next on the list was SCRUM, followed by Extreme Programming (XP) all of which are agile systems development methodologies. These were followed by STRADIS and ETHICS. This is an indication that agile systems development methodologies are more popular than traditional systems development methodologies.

The highest intensity of use for systems development methodologies was recorded for agile systems development methodologies, especially SCRUM with a total of 68 respondents and RAD with a total of 65 respondents who indicated that they are using it very frequently or intensively. Third on the list was Object Oriented Software Engineering (OOSE) with 30 respondents. Extreme Programming was fourth on the list with 27 respondents. This is an indication that agile systems development methodologies are not only popular; but that they are also used intensively in IS departments. It may be contributed to the fact that "Agile systems development methodologies are much more flexible and people centric than traditional systems development methodologies" (Vinekar *et al*. 2006).

To measure how widely SDMs are used, we investigated the number of people in the IS department that used systems development methodologies, and the number of projects

that are developed using systems development methodologies. Systems development methodologies were also being widely used as highlighted by the majority (59%) of respondents indicating that at least 6 – 50 people were using systems development methodologies in their I.S departments. Research also revealed at most 1 – 10 projects were being developed using systems development methodologies. 64% of the respondents indicated to this effect. Given the size of the I.S. department of the respondents, where 74% of the respondents indicated that their IS department consists of 50 people or less, it can be deduced that systems development methodologies were being widely used.

To determine the strictness of systems development methodologies' use, the respondents were asked to indicate whether they use systems development methodologies as a general guideline for all projects, whether they adapted it on a project-to-project basis, or whether they regard it as a standard which is followed rigorously for all projects. The results showed that 45% of the respondents were adapting systems development methodologies on a project by project basis, with 40% using systems development methodologies as a general guideline for all projects and 14% using systems development methodologies as a standard followed rigorously for all projects. This finding is in line with current movement towards the contingent use of systems development methodologies. This era is being presented by situations that do not follow an ideal stated type and hence the "one systems development methodology for all developments" does not adequately provide the much needed solution. The contingent use of systems development methodologies allows for the use of different approaches depending on the situation at hand (Avison and Fitzgerald, 2006).

As for the future use of systems development methodologies, the majority (52%) indicated that they expected no change in the next two years with regards to how they were using their systems development methodologies. This means they were satisfied with the use of their systems development methodologies. 42% of the respondents indicated that they wanted to make more use of their systems development methodologies. This shows that they appreciated the benefits of using systems development methodologies.

All this describes the current situation with regards to the use of systems development methodologies in South Africa. The overwhelming majority of respondents indicated that they are using systems development methodologies. The most popular systems

development methodologies are agile systems development methodologies. Systems development methodologies are being used widely, adapted on a project to project basis, with the highest intensity being recorded for agile systems development methodologies and the majority of respondents expecting no change on how they are using systems development methodologies in the next two years.

Research objective 2 – **Determine the effectiveness of systems development methodologies in South Africa**.

We will address this research objective by discussing the following:

- Outcome of the last project respondents were involved with
- Respondents perceptions regarding the support provided by systems development methodologies as control technology
- Quality of the process followed during the last project respondents were involved with
- Quality of the product during the last project respondents were involved with

97.4% of the respondents indicated that they used a systems development methodology on their last projects. Most projects were developed using the agile systems development methodologies, with the RAD (26.8%) and SCRUM (20.4%) being the most used. The majority (31%) of the respondents indicated that they had worked on large projects taking at least 6 months to complete as their last projects during the time of the survey. 80% of the projects developed using systems development methodologies were completed, implemented and in use. This shows an increase in the number of projects succeeding when compared to the 2012 CHAOS report statistics. The 2012 CHAOS results showed an increase in project success rates from 2011 to 2012. It showed that as of 2012, 39% of all projects succeeded in terms of being within the budget, being delivered on time with required features and functions. 43% of all projects were challenged and 18% of all projects had failed by either being cancelled before completion or never been used. This increase in the project success rates may be attributed to the support provided by systems development methodologies as control technology.

In table 5.1 below the 9 items that were used to measure the support provided by systems development methodologies as control technology are depicted in the first column. The rest of the columns represent the percentage of respondents that agreed, disagreed or

were neutral about the item. It was calculated as follows: Since the response frequencies were based on a scale 1 to 5, with 1 being “totally disagree” and 5 being “totally agree”:

Response frequency 1 + response frequency 2 = Disagreed
Response frequency 3 = Neutral
Response frequency 4 + response frequency 5 = Agreed

Table 5.1 Support provided as control technology by systems development methodologies

Item	Disagreed (%)	Neutral (%)	Agreed (%)
A systems development methodology helps to decompose the system to be developed in workable parts.	1.4	12.9	85.7
A systems development methodology helps to estimate the size of the system to be developed.	5.4	36.7	57.8
A systems development methodology helps to estimate the time and effort required for the development of a planned system.	3.4	31.3	65.3
A systems development methodology helps to plan systems development projects.	4.8	12.2	83.0
A systems development methodology helps in defining useful milestones for our systems development projects.	2.0	25.2	72.8
A systems development methodology helps to organise systems development projects.	8.8	19.7	71.4
A systems development methodology helps to keep our systems development projects under control.	12.9	19.0	68.0
A systems development methodology helps to estimate the project risks.	15.6	45.6	38.8
Overall, a systems development methodology helps us to manage our systems development projects.	5.4	13.6	81.0

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For eight of the nine items, the respondents agreed that systems development methodologies provide support as control technology. Based on the results recorded in table 5.1, it can be noted that the majority 85.7% agreed that a systems development methodology helps to decompose the system to be developed in workable parts. The majority 57.8% agreed that a systems development methodology helps to estimate the size of the system to be developed. The majority 65.3% agreed that a systems development methodology helps to estimate the time and effort required for the development of a planned system. The majority 83% agreed that a systems development methodology helps to plan systems development projects. The majority 72.8 agreed that a systems development methodology helps in defining useful milestones for our systems development projects. The majority 71.4% agreed that a systems development methodology helps to organise systems development projects. The majority 68.0% agreed that a systems development methodology helps to keep systems development projects under control. The majority 81.0% agreed that overall, a systems development methodology helps to manage systems development projects. One exception was whether systems development methodologies could help to estimate the project risks. The majority 45.6% were neutral regarding this item. Since agile systems developments were the most popular systems development methodologies used on the projects, one may speculate that the respondents were very satisfied with the general project management support provided by them, but that risk management was lacking. This is normally associated with traditional systems development methodologies.

In summary, it is evident that systems development methodologies provide support to the development of projects. This was noted by the number of projects developed using systems development methodologies and the fact that the majority of these projects were completed, implemented and were in use.

As for Quality of the process followed during the last project respondents were involved with, table 5.2 shows the 9 items that were used to measure this. The items are listed in the first column. The rest of the columns represent the percentage of respondents that agreed, disagreed or were neutral about the item. It was calculated as follows: Since the response frequencies were based on a scale 1 to 5, with 1 being “totally disagree” and 5 being “totally agree”:

Response frequency 1 + response frequency 2 = Disagreed

Response frequency 3 = Neutral

Response frequency 4 + response frequency 5 = Agreed

Table 5.2: Quality of process followed during the last project

Item	Disagreed (%)	Neutral (%)	Agreed (%)
The project was completed on schedule	12.2	40.5	47.3
The project was completed within the budget	11.4	45	43.6
The developed system satisfied all the stated requirements	7.9	31.8	60.3
The speed of developing the project was high	20.8	34.9	44.3
The productivity of developers involved with the project was high	7.9	37.7	54.3
The cost of the project is low when compared to the size and complexity of the system developed	20.8	42.3	36.9
The project achieved its goals	4.6	22.5	72.8
Overall, the project represents excellent work	5.3	18.5	76.2
Overall, the project was a success	6.6	17.9	75.5

For seven of the 9 items, the respondents agreed that systems development methodologies improved the quality of the process during the last project they were involved with. The seven items were the project was completed on schedule, the developed system satisfied all the stated requirements, the speed of developing the project was high, the productivity of developers involved with the project was high, the project achieved its goals, overall the project represented excellent work and overall the project was a success.

However there were two exceptional items were the respondents were neutral, these were the project was completed within the budget and the cost of the project was low when compared to the size and complexity of the system developed. These two items are describing the financial implication of using a systems development methodology. The results indicate that the respondents are not convinced about the financial benefits of using a systems development methodology, especially agile systems development methodologies. It may be contributed to the fact that the commitment to scope and cost is poor in agile projects (Goodpasture, 2010:25).

In summary, it is evident that systems development methodologies improve the quality of process of development projects. This was noted by the respondents' last projects being completed on schedule, satisfying all the stated requirements, speed of development

being high, productivity of developers involved with the project being high, projects achieving their goals and overall, the projects being a success.

As for quality of the product during the last project respondents were involved with, table 5.3 shows the 11 items that were used to measure this. The items are listed in the first column. The rest of the columns represent the percentage of respondents that agreed, disagreed or were neutral about the item. It was calculated as follows: Since the response frequencies were based on a scale 1 to 5, with 1 being “totally disagree” and 5 being “totally agree”:

Response frequency 1 + response frequency 2 = Disagreed
Response frequency 3 = Neutral
Response frequency 4 + response frequency 5 = Agreed

Table 5.3: Quality of product during last project

Item	Disagreed (%)	Neutral (%)	Agreed (%)
The functionality of the developed system is high	6.6	20.4	73.0
The reliability of the developed system is high	5.9	27.6	66.4
The maintainability of the developed system is high	13.2	37.1	50
The portability of the developed system is high	12.5	34.2	53.3
The efficiency of the developed system is high	5.9	21.1	73.0
The usability of the developed system is high	9.2	30.9	59.9
The developed system meets user needs	5.3	22.4	72.4
The documentation of the developed system is good	25.0	44.7	30.3
Overall, the quality of the developed system is high	4.6	26.3	69.1
Overall, the users are satisfied with the developed system	6.0	23.8	70.2
Overall, the developed system is a success	8	13.3	78.7

For 10 of the 11 items, the respondents agreed that systems development methodologies improved the quality of the product during the last project they were involved with. It can be noted that the majority 73% agreed that the functionality of the developed system was high. The majority 66.4% agreed that the reliability of the developed system was high. The majority 50% agreed that the maintainability of the developed system was high. The majority 53.3% agreed that the portability of the developed system was high. The majority 73% agreed that the efficiency of the developed system was high. The majority 59.9% agreed that the usability of the developed system was high. The majority 72.4% agreed that the developed system met user needs. The majority 69.1% agreed that overall, the

quality of the developed system was high. The majority 70.2% agreed that overall, the users were satisfied with the developed system. The majority 78.7% agreed that overall, the developed system is a success. There was one exception on whether the documentation of the developed system was good; the majority 44.7% were neutral with regards to this. One may speculate that the respondents were generally satisfied with the quality of the product provided by systems development methodologies, though there was no clear cut indication on the status of the documentation. This is normally associated with traditional systems development methodologies, and not with agile systems development methodologies which do not produce a lot of documentation.

In summary, it is evident that systems development methodologies improve the quality of the developed product. This was noted by the respondents' last project products having high functionality, reliability, maintainability, portability, efficiency, usability, meeting user needs, being of high quality, users being satisfied with the developed system and the developed system being a success.

Research objective 3 - Determine the perception of developers with regards to systems development methodologies and power.

We will address this research objective by discussing the following:

- How do the respondents perceive their individual power?
- How do the respondents perceive the use of power in their organisations?
- What types of power are exercised by the respondents?
- What types of power do respondents experience in their organisations?
- What types of power would the respondents like to leverage in the future?
- Are systems development methodologies helping managers to gain control over team members?
- Are systems development methodologies enslaving systems developers?

On how the respondents perceived their individual power, 1 item in the form of a direct question was used to measure this; the question posed was "how powerful do you think you are at work". The responses were ranked from 1 – 5, 1 being "not at all powerful" and 5 being "very powerful". Table shows the item that was used to measure this. It is calculated as follows:

Response frequency 1 + response frequency 2 = Not powerful

Response frequency 3 = Neutral

Response frequency 4 + response frequency 5 = Powerful

Table 5.4 Perceived individual power

Item	Not powerful (%)	Neutral (%)	Powerful (%)
How powerful do you think you are at work?	5.9	34.9	59.2

The majority of the respondents 59.2% perceived that they were powerful at work, with 34.9% neutral about their perceived individual power and 5.9% perceived they were not powerful at work.

In summary, it can be speculated that the majority of the respondents have the potential to influence the decisions of others at their workplaces.

On how the respondents perceived the use of power in their organisations, five items were used to measure this. The first column illustrates the items and the rest of the columns represent the percentage of respondents that agreed, disagreed or were neutral about the item. It was calculated as follows: Since the response frequencies were based on a scale 1 to 5, with 1 being “totally disagree” and 5 being “totally agree”:

Response frequency 1 + response frequency 2 = Disagreed

Response frequency 3 = Neutral

Response frequency 4 + response frequency 5 = Agreed

Table 5.5: Use of power within organisations

Item	Disagreed (%)	Neutral (%)	Agreed (%)
My organisation empowers people at all levels	9.8	31.4	58.8
In my organisation, power is concentrated in the hands of a few select individuals	26.1	26.1	47.7
My organisation rewards leaders for empowering their people	16.3	40.5	43.1
My organisation teaches leaders how to leverage their full power	13.7	41.2	45.1
Power is misused by top leaders in my organisation	34.6	33.3	32.0

The majority of the respondents 58.8% agreed that their organisations were empowering people at all levels. The majority 47.7% also agreed that in their organisations power was concentrated in the hands of a few select individuals. 43.1% which is the majority agreed that their organisations were rewarding leaders for empowering their people. The majority 45.1% agreed that their organisations were teaching leaders how to leverage their full power. The majority 34.6% disagreed that power was being misused by top leaders in their organisations.

In summary, it can be noted that though power is concentrated in the hands of a select few, the organisations still empower people at all levels. This may be attributed to the leadership style of those in positions of power. Since agile systems development methodologies were most popular with the respondents in their last projects, these agile systems development methodologies empower individuals by regarding a manager as a facilitator. Another factor could be the highest qualification obtained by the respondents, since the majority 61% had obtained an honours or masters degree, education may be viewed as “empowering” by those in positions of power at workplaces. Though organisations teach leaders how to leverage their full power, respondents still disagreed that power was misused by top leaders in their organisations. Organisational structures and cultures may also have an impact of the use of power within organisations.

On the types of power exercised by the respondents, 7 items were used to measure this. This is summarised in table 5.6 below. The first column highlights the item and the rest of the columns represent the percentage of respondents that exercised power to a little extent, in-between and great extent. It was calculated as follows: Since the response frequencies were based on a scale 1 to 5, with 1 being “very little extent” and 5 being “very great extent”:

Response frequency 1 + response frequency 2 = little extent
Response frequency 3 = in-between
Response frequency 4 + response frequency 5 = great extent

Table 5.6: Types of power – Individual exercise of power

Item	Little extent (%)	In-between (%)	Great extent (%)
The power of position (is the formal authority that derives from a person's title or position in a group or an organisation)	11.8	38.6	49.7
The power of charisma (is the influence that is generated by a leader's style or persona)	3.3	21.6	75.2
The power of relationships (is the influence that leaders gain through their formal and informal networks both inside and outside of their organisations)	3.3	15.7	81.0
The power of information (is the control that is generated through the use of evidence deployed to make an argument)	2.0	11.1	87.0
The power of expertise (is the influence that comes from developing and communicating specialised knowledge / or the perception of knowledge)	0.0	5.9	94.1
The power to punish others	83.0	15.7	1.3
The power to reward others	6.5	21.6	71.9

The majority of the respondents highlighted that they were exercising the power of position (49.7%), power of charisma (75.2%), power of relationships (81%) and power of information (87%), power of expertise (94.1%) and power to reward others (71.9%) to a great extent. The power to punish others was being exercised to a little extent by the majority of the respondents (83%).

In summary, it can be noted that the respondents have the potential to influence the behaviour of those underneath them at the workplace. This can come in different types but it is still power being exercised. However, the power to punish is only exercised to a little extent, this can be attributed to the type of systems development being used, and this is common with the use of agile systems development methodologies. The use of agile systems development methodologies is characterised by collaborative work, team reward systems, pluralist decision making and by being people centric.

On the types of power experienced by respondents at their workplaces, 7 items were used to measure this. This is summarised in table 5.7 below. The first column highlights the item

and the rest of the columns represent the percentage of respondents that experienced power to a little extent, in-between and great extent. It was calculated as follows: Since the response frequencies were based on a scale 1 to 5, with 1 being “very little extent” and 5 being “very great extent”:

Response frequency 1 + response frequency 2 = little extent
Response frequency 3 = in-between
Response frequency 4 + response frequency 5 = great extent

Table 5.7: Types of power experienced by respondents at the workplace

Item	Little extent (%)	In-between (%)	Great extent (%)
The power of position (is the formal authority that derives from a person’s title or position in a group or an organisation)	6.5	23.5	69.9
The power of charisma (is the influence that is generated by a leader’s style or persona)	3.3	29.4	67.3
The power of relationships (is the influence that leaders gain through their formal and informal networks both inside and outside of their organisations)	2.0	16.4	81.6
The power of information (is the control that is generated through the use of evidence deployed to make an argument)	1.3	8.5	90.2
The power of expertise (is the influence that comes from developing and communicating specialised knowledge / or the perception of knowledge)	0.7	8.5	90.8
The power to punish others	62.1	28.8	9.2
The power to reward others	13.1	34.0	52.9

The majority of the respondents highlighted that they were experiencing the power of position (69.9%), power of charisma (67.3%), power of relationships (81.6%), power of information (90.2%), power of expertise (90.8%) and power to reward others (52.9%) to a great extent from their superiors at work. The power to punish others was being experienced to a little extent by the majority of the respondents (62.1%).

In summary it can be noted that the respondents were also being influenced by their superiors at work through the various types of power exerted. However, they were experiencing the power to punish others to some extent.

On the three main sources of power the respondents would like to exert leverage in the next five years. The power of expertise was ranked most critical, followed by the power of information and, in third place, the power of relationships. In summary, it can be noted that the respondents aspire to gain more expertise and make greater use of information in order to influence the behaviour and or decision making processes at their workplaces. The power of relationships is also deemed crucial for them to leverage in future. This may be attributed to the move from traditional systems development methodologies to agile systems development methodologies, from the "autonomous" way of doing things to the "cooperative" way of doing things and also from the "command and control" to the "leadership and collaboration".

After the discussion on the perceptions of the respondents regarding power exercised and experienced in their organisation, we will now focus on whether systems development methodologies are helping managers gain control over team members and enslaving systems developers. Two items were used to measure this. This is summarised in table 5.8 below. The first column illustrates the item and the rest of the columns represent the percentage of respondents that agreed, disagreed or were neutral about the item. It was calculated as follows: Since the response frequencies were based on a scale 1 to 5, with 1 being "totally disagree" and 5 being "totally agree":

Response frequency 1 + response frequency 2 = Disagreed
Response frequency 3 = Neutral
Response frequency 4 + response frequency 5 = Agreed

Table 5.8: Are SDMs helping managers gain control over team members & enslaving systems developers?

Item	Disagreed (%)	Neutral (%)	Agreed (%)
A systems development methodology helps managers gain control over team members	10.3	19.3	70.3
A systems development methodology enslaves systems developers	32	36.1	32

The majority (70.3%) of the respondents agreed that managers were using systems development methodologies to gain control over team members. However the majority (36%) of the respondents neither agreed nor disagreed on systems development methodologies enslaving systems developers. These helped answer the question “are systems development methodologies empowering managers?” 32% agreed that systems development methodologies were enslaving systems developers and 32% also disagreed to that effect. It is clear that the majority of the respondents neither agreed nor disagreed to systems development methodologies enslaving systems developers. This highlighted a mixed reaction to the question “are systems development methodologies enslaving systems developers?”

In summary, it is evident that managers are deriving the benefits of gaining control over team members, through the use of systems development methodologies. The question of whether systems development methodologies were enslaving systems developers produced a mixed reaction with the majority of the respondents neither agreeing nor disagreeing to that effect. This mixed reaction may be attributed to the contingent use of systems development methodologies since the systems development methodologies are adapted to best meet the situation at hand. As a result the question of “being enslaved” is counteracted by the benefits derived from the use of systems development methodologies.

Research objective 4a - Determine the relationship between power and systems development methodologies’ use.

In this study we focused on the type of systems development methodology used, the intensity of systems development methodology use, how systems development methodologies are used, how strictly systems development methodologies are used and the future use of systems development methodologies. Regarding power, we focused on the perceived individual power, the use of power in the organisation, the type of power an individual exercises, the type of power an individual experiences, and the type of power an individual would like to leverage in future.
In order to address the above research objective we will report the correlations that exist between the following:

- The correlation between the type and intensity of systems development methodologies used and the perceived individual power, the use of power in the organisation, the type of power exercised, the type of power experienced, the

control by systems development methodologies and the enslavement of systems development methodologies.

- The correlation between how widely (horizontal) systems development methodologies are used and the perceived individual power, the use of power in the organisation, the type of power exercised, the type of power experienced, the control by systems development methodologies and the enslavement of systems development methodologies.
- The correlation between the strictness of systems development methodologies used and the perceived individual power, the use of power in the organisation, the type of power exercised, the type of power experienced , the control by systems development methodologies and the enslavement by systems development methodologies.
- The correlation between the future use of systems development methodologies and the perceived individual power, the use of power in the organisation, the type of power exercised, the type of power experienced, the control by systems development methodologies and the enslavement by systems development methodologies.

For the correlations, the Spearman's rho was used to analyse associations between the data. The closer the value is to 1, the stronger the correlation (Field, 2005). The following categories will be used to describe the strength of the correlation:

- Values between 0.0 and 0.2 indicate a weak relationship
- Values between 0.2 and 0.4 indicate a moderate relationship
- Values between o.4 and 0.6 indicate a strong relationship
- Values between 0.6 and 1 indicate a very strong relationship

When the analysis was done, all significant correlations between questions were indicated by a superscript * in the results table. These were selected for reporting.

For the correlation between the type and intensity of systems development methodologies used and the perceived individual power, the use of power in the organisation, the type of power exercised, the type of power experienced, the control by systems development methodologies and the enslavement by systems development methodologies. The results in table 5.9 were noted.

Table 5.9: Correlations between the type and intensity of SDM used and the perceived individual power, the use of power in the organisation, the type of power exercised, the type of power experienced, the control by SDMs and the enslavement by SDMs

		Type & intensity of SDM used								
		Correlation coefficients								
		STRADIS Ques 7.1	IE Ques 7.2	ETHICS Ques 7.3	SSM Ques 7.4	RAD Ques 7.5	OOSE Ques 7.6	RUP Ques 7.7	XP Ques 7.8	SCRUM Ques 7.9
Perceived individual power	Ques17.1	.161	.091	.120	.164	.080	-.402*	.256	.294*	.029
Use of power in organisations	Ques 18.1 (Organisation empowers people at all levels)	-.237	-.379*	-.329*	-.093	-.259*	.179	-.296	.008	.127
	Ques 18.2 (Power is concentrated)	.352*	.356	.407*	.399*	.222*	-.033	.017	.042	-.167
	Ques 18.3 (Organisation rewards leaders for empowering their people)	.102	-.014	-.174	.281	-.060	.033	-.097	.000	.023
	Ques 18.4 (Organisation teaches leaders to leverage full power)	-.077	.222	.088	.048	.132	.223	.388	.459*	-.098
	Ques 18.5 (Power is misused)	.135	.361	.215	.254	.113	.083	.178	-.110	-.211*
Type of power exercised	Ques 19.1 (Power of position)	.182	.221	.311*	.417*	.165	-.331*	-.018	.223	.147
	Ques 19.2 (power of charisma)	.322*	.080	.290	.129	.187	-.033	.521*	.320*	.180
	Ques 19.3 (power of relationships)	.067	.059	.208	-.053	.098	.203	-.273	-.205	.151
	Ques 19.4	.096	.001	.171	-.015	-.041	-.206	-.228	-.187	.336*

	(Power of information)									
	Ques 19.5 (Power of expertise)	.147	.163	.304*	-1.05	.094	.224	-.149	-.036	.267*
	Ques 19.6 (Power to punish others)	.155	.116	-.022	.440*	.086	.064	.032	.246	-.201
	Ques 19.7 (Power to reward others)	.107	.354	.439*	.341*	.218*	.031	.394	.219	.038
Type of power experienced	Ques 20.1 (Power of position	.410*	.206	.194	.486*	.096	-.088	.057	.020	-.069
	Ques 20.2 (Power of charisma)	.221	.347	.445*	.177	.275*	.406*	.382	.408	.119
	Ques 20.3 (Power of relationships)	.160	.126	.170	.238	.018	.498*	-.076	-.204	-.093
	Ques 20.4 (Power of information)	.123	.102	.046	-.342	.152	.395*	.215	.024	.187
	Ques 20.5 (Power of expertise)	.152	.098	.261	.154	.096	.394*	-.138	.018	-.011
	Ques 20.6 (Power to punish others)	.321*	.211	.141	.088	.161	-.259	-.176	.166	.015
	Ques 20.7 (Power to reward others)	.123	.257	.284	.076	.041	-.020	.342	.136	.078
Control by SDM	Ques 12.5 (SDM helps managers gain control)	.117	.562*	.619*	.191	.263*	-.094	.403	.487*	.182
Enslavement by SDM	Ques 12.6 (SDM enslaves systems developers)	.194	.238	.289	.246	.327*	-.255	.255	.399*	.166

It can be noted that there is a significant negative strong relationship between the traditional systems development methodology (OOSE) and the perceived individual power (-.402*). This means that as the type and intensity of the OOSE traditional systems

development methodology use increases, the individual perception of power decreases. This may be attributed to the “command and control” of traditional systems development methodologies, in particular the OOSE. It can be noted that there is a significant positive moderate relationship between the agile systems development methodology XP and the perceived individual power (.294*). This means that as the type and intensity of use of agile systems development methodologies, in particular XP, increases, the perceived individual power also increases. This may be attributed to the “leadership and collaboration” nature of agile systems development methodologies.

In summary, it is evident that the use of traditional systems development methodologies seems to reduce or take away the perceived individual power of individuals, hence “enslaving”. On the other hand, the use of agile systems development methodologies seems to increase or add to the perceived individual power of individuals, hence “empowering”.

It can be noted that the question of organisations empowering people at all levels had significant moderate relationships with traditional systems development specifically IE (-.379*) and ETHICS (-.329*), as well as the agile systems development methodology RAD (-.259*). This means that as the type and intensity of these named systems development methodologies increase, the empowering of people at all levels by the organisation decreases. This is a common feature of the use of traditional systems development methodologies as also indicated in the correlations above; however there was an exception with the agile systems development methodology RAD. This exception might be attributed to the respondents’ particular organisational culture or other external factors.

It can be noted that the question of power being concentrated in the hands of a few select in organisations had a positive moderate relationship with the type and intensity of the following traditional systems development methodologies STRADIS (.352*), SSM (.399*), a positive strong relationship with ETHICS (.407*) and a positive moderate relationship with RAD (.222*). This means as the type and intensity of these methodologies increases, the concentration of power in the hands of a few select also increases. Which is a common feature of traditional systems development methodologies through the “autonomous and disciplined” approach followed with such systems development methodologies. However, there was an exception with the RAD agile systems development methodology. This exception can be attributed to the organisational culture.

It can be noted that there were no significant relationships between the question of organisations rewarding leaders for empowering their people and the type and intensity of systems development methodologies used.

It can be noted that the question of organisations teaching their leaders to leverage full power had a positive strong relationship with the agile systems development methodology XP (.459*). This means as the type and intensity of XP increases, the teaching of leaders to leverage full power also increases. Since power comes in many types ranging from power of position to power to reward others, this may be attributed to the “flexibility and pluralist decision making” common with agile systems development methodologies.

It can be noted that the question of power being misused by top leaders in organisations had a significant negative moderate relationship with the agile systems development methodology SCRUM (-.211*). This means as the type and intensity of SCRUM increases, the misuse of power by top leaders in organisations decreases. This shows that agile systems development methodologies, specifically SCRUM, are people centric and liberating, as shown by a reduction of misuse of power. The reduction of misuse of power, translates to the empowerment of individuals, which is a positive aspect of agile systems development methodologies.

In summary, it is evident that the type and intensity of use of traditional systems development methodologies is linked to the negative use of power in organisations. On the other hand, the type and intensity of use of agile systems development methodologies is linked to the positive use of power in organisations, which is more of empowering than centralizing power. However, there was an exception with RAD.

It can be noted that the individual exercise of power – power of position had a significant positive moderate relationship with ETHICS (.311*), a significant positive strong relationship with SSM (.417*) and a significant negative moderate relationship with OOSE (-.331*). All these are traditional systems development methodologies. For ETHICS and SSM it shows that as the intensity of use increases, the power of position also increases. There is an exception with OOSE, in which as the intensity of use increases, the power of position decreases. This means that for those using OOSE as the intensity of use increases, their individual exercise of the power of position decreases, meaning their formal authority attached to their titles decreases. However for those using ETHICS and

SSM as the intensity of use increases, their individual exercise of the power of position also increases. This means their formal authority attached to their titles also increases, meaning they become more powerful, which is a common feature of traditional systems development methodologies.

It can be noted that the individual exercise of power – power of charisma had significant positive moderate relationships with STRADIS (.322*) and XP (.320*) and a positive strong relationship with RUP (.521*). Of these 3 systems development methodologies, XP is the only agile systems development methodology. This shows that regardless of the type and intensity of the systems development methodology, as the type and intensity increases, the power of charisma also increases. This specific power of charisma is the influence generated by a leader's style or persona. Meaning, this influence whether good or bad increases as the type and intensity of both traditional and agile systems development methodologies increase.

It can be noted that there were no significant relationships between the type and intensity of use and the individual exercise of power – power of relationships.

It can be noted that the individual exercise of power – power of expertise had positive moderate relationships with ETHICS (.304*) and SCRUM (.267*). This shows that as the intensity of use of these named methodologies increase, the individual exercise of this power of expertise also increases. This shows that regardless of the type and intensity of use of a systems development methodology, a certain level of skill is required to successfully and effectively implement the systems development methodology. The only distinction will be that traditional systems development methodologies require the employment of specialized skills and agile systems development methodologies require the employment of multi-disciplinary skills.

It can be noted that the individual exercise of power – power to punish others had a significant strong relationship with the type and intensity of use of a traditional systems development methodology SSM (.440*). This means as the intensity of use of this traditional systems development methodology increase, the power to punish others also increases. This means traditional systems development methodologies, especially SSM, are used to enforce how things are to be done, hence follow a "disciplined" approach.

It can be noted that the individual exercise of power – power to reward others had a significantly strong relationship with ETHICS (.439*) and significant moderate relationships with RAD (.218*) and SSM (.341*). This shows that regardless of the type and intensity of use of systems development methodologies, the respondents are satisfied with the reward structures and feel they should also reward others. This can be in the form of team reward systems for those using agile systems development methodologies and individual reward systems for those using traditional systems development methodologies.

In summary, it is evident that power individual exercise of power can be positive or negative. The use of traditional systems development methodologies is mostly associated with the power to “punish” others. However, both agile and traditional systems development methodologies indicated a positive power to reward others.

It can be noted that the type of power experienced- power of position had a significant positive relationship with the traditional systems development methodologies STRADIS (.410*) and SSM (.486). This shows that those using traditional systems development methodologies, especially, STRADIS and SSM experience this power of position more as the use and intensity of such systems development methodologies increase.
It can be noted that the type of power experienced – power of charisma had a significant strong positive relationship with traditional systems development methodologies ETHICS (.445*) and OOSE (.406*), and a significant positive moderate relationship with agile systems development methodology RAD (.275*). This means that regardless of the type and intensity of use of systems development methodologies, as the intensity of use increases, the power of charisma experienced also increase. Since this is the influence that is generated by a leader’s style or persona, those experiencing the negative effects of this type of power will continue to experience it and those experiencing the positive effects of this type of power will also continue to experience it.

It can be noted that the type of power experienced – power of relationships had a significant positive strong relationship with the traditional systems development methodology OOSE (.498*). This may be attributed to traditional systems development methodologies being characterised by large teams. As a result of working in large teams, they experience this type of power more, as they need to derive the benefits of this type of power or influence.

It can be noted that the type of power experienced – power of information had a significant positive moderate relationship with the traditional systems development methodology OOSE (.395*). This shows that, since traditional systems development methodologies are characterised by large teams, they need to receive as much information as possible to be able to attain the specialized skills. Since they follow disciplined and autonomous approaches, they experience this control that is generated through the use of evidence deployed or that has been accumulated by those above them at the workplace to make an argument.

It can be noted that the type of power experienced – power of expertise had a significant positive moderate relationship with the traditional systems development methodology OOSE (.394*). This means as the type and intensity of use of this systems development methodology increases, the power of expertise experienced also increases. The power of expertise is the influence that comes from developing and communicating specialized knowledge or the perception of knowledge, this is a feature of traditional systems development methodologies since there is need to employ specialized skills. How this type of power is utilised together with organisational policies will determine who has the final decision making power.

It can be noted that the type of power experienced – power to punish others had a significant positive moderate relationship with the traditional systems development methodology STRADIS (.321*). This means as the type and intensity of use of this traditional systems development methodology increase, the power to punish others experienced also increases. This may be attributed to the “disciplined” approach of traditional systems development methodologies and also managers being seen as “planners”.

It can be noted that there were no significant relationships between the type of power experienced – power to reward others and the type and intensity of systems development methodologies.

In summary, it is evident that those using the traditional systems development methodologies experience the power of position, power to punish others, power of relationships, power of expertise and power of information more as compared to those using agile systems development methodologies. However, both those using traditional systems development methodologies and agile systems development methodologies experience the power of charisma.

It can be noted that the question of systems development methodologies helping managers to gain control over team members had a significant positive very strong relationship with ETHICS (.619*), strong positive relationships with XP (.487*) and IE (.562*) and a moderate positive relationship with RAD (.263*). ETHICS and IE are traditional systems development methodologies, RAD and XP are agile systems development methodologies. This shows that regardless of the type and intensity of systems development methodologies used, managers are being assisted by systems development methodologies to gain control over team members.

It can be noted that the question of systems development methodologies enslaving systems developers had a significant positive moderate relationship with agile systems development methodologies RAD (.327*) and XP (.399*). This is in line with the move towards the contingent use of systems development methodologies. The contingent use of systems development methodologies is about adapting systems development methodologies to solve the situation at hand, hence “liberating” systems developers.

In summary, systems development methodologies are helping managers to gain control over team members. Systems developers feel restricted by the use of systems development methodologies hence the move towards the contingent use of systems development methodologies.

For the correlation between how widely (horizontal) SDMs are used and the perceived individual power, the use of power in the organisation, the type of power exercised, the type of power experienced, the control by systems development methodologies and the enslavement by systems development methodologies. When the analysis was done, all significant correlations between questions were indicated by a superscript * in the results table. These were selected for reporting. The results are recorded in table 5.10:

Table 5.10: Correlations between how widely (horizontal) SDMs are used and the perceived individual power, the use of power in the organisation, the type of power exercised, the type of power experienced, the control by SDMs and the enslavement by SDMs

		How widely SDMs are used	
		Correlation coefficients	
		Number of people using SDMs within an IS Department Question 8	Number of projects developed using SDMs Question 9
Perceived individual power	Ques17.1	.064	.057
Use of power in organisations	Ques 18.1 (Organisation empowers people at all levels)	.004	-.017
	Ques 18.2 (Power is concentrated)	-.065	.032
	Ques 18.3 (Organisation rewards leaders for empowering their people)	.095	-.203*
	Ques 18.4 (Organisation teaches leaders to leverage full power)	.125	-.031
	Ques 18.5 (Power is misused)	-.096	-.149
Type of power exercised	Ques 19.1 (Power of position)	.000	-.044
	Ques 19.2 (power of charisma)	.197*	.184*
	Ques 19.3 (power of relationships)	-.031	.112
	Ques 19.4 (Power of information)	.114	.271*
	Ques 19.5 (Power of expertise)	-.058	.118
	Ques 19.6 (Power to punish others)	.032	-.187*
	Ques 19.7 (Power to reward others)	.257*	.163*
Type of power experienced	Ques 20.1 (Power of position	-.110	-.032
	Ques 20.2 (Power of charisma)	.047	.196*
	Ques 20.3 (Power of relationships)	.057	.033
	Ques 20.4 (Power of information)	.064	.014
	Ques 20.5 (Power of expertise)	.159	.216*
	Ques 20.6 (Power to punish others)	-.209*	.001
	Ques 20.7 (Power to reward others)	.136	-.071
Control by SDM	Ques 12.5 (SDM helps managers gain control)	.045	.110
Enslavement by SDM	Ques 12.6 (SDM enslaves systems developers)	-.123	.135

It can be noted that the number of projects developed using systems development methodologies had a significant negative moderate relationship with the question of organisations rewarding their leaders for empowering their people (-.203*). This means

that as the number of projects developed using systems development methodologies increase, the rewarding of leaders for empowering their people decreases. This may be linked to the organisational culture and reward structures.

It can be noted that the type of power exercised – power of charisma had a significant positive weak relationship with the number of people using systems development methodologies in an IS department (.197*) and a significant positive weak relationship with the number of projects developed using systems development methodologies (.184*). This means as the power of charisma exercised increases so does the number of people and this will lead to more projects being developed using systems development methodologies. The influence generated by the leader's style or persona has the ability to build a conducive and "attractive" working environment with those below him in an organisation.
It can be noted that the power of information exercised had a significant moderate relationship with the number of projects developed using systems development methodologies (.271*). This means as the power of information exercised increases, the number of projects developed using systems development methodologies also increases. This may be attributed to the fact that individuals need the right information at the right time to make effective decisions. This may be in the form of proof or evidence on how to effectively implement systems development methodologies when developing projects.

It can be noted that the power to punish others exercised had a significant negative weak relationship with the number of projects developed using systems developed methodologies (-.187*). This means as the power to punish others is exercised more, the number of projects developed using systems development methodologies will decrease. The increase in the exercise of the power to punish others creates limitations and an unpleasant environment. This in turn affects the rate at which projects are developed.

It can be noted that the type of power exercised – power to reward others had a significant positive moderate relationship with the number of people using systems development methodologies (.257*) and a significant positive weak relationship with the number of projects developed using systems development methodologies. This may be attributed to the motivation that is brought through the exercise of the power to reward others. This means the as long as the subordinated feel valued and appreciated for their efforts, they also become more effective and develop more projects. As the rewards are increased, the

number of projects developed using systems development methodologies will also increase.

In summary, the type of power exercised especially the power of charisma and power to reward others, increase the number of people using systems development methodologies in an IS department and also the number of projects developed using systems development methodologies. However, the power to punish others exercised has a negative effect on the number of projects developed using systems development methodologies.

It can be noted that the type of power experienced – power of charisma had a significant positive weak relationship with the number of projects developed using systems development methodologies (.196*). This may be attributed to the influence that a leader generates through his or her leadership style or persona. As this type of power experienced increase, the number of projects developed using systems development methodologies also increase.

It can be noted that the type of power experienced – power of expertise had a significant positive moderate relationship with the number of projects developed using systems development methodologies (.216*). This means as the power of expertise experienced increases, the number of projects developed using systems development methodologies also increase. This influence that comes from developing and communicating specialised knowledge, enables the subordinates to also gain knowledge and the skills needed to effectively develop the projects using systems development methodologies, resulting in an increase in the number of projects developed.

It can be noted that the type of power experienced – power to punish others had a significant negative moderate relationship with the number of people using systems development methodologies in an IS department (-.209*). This means as the power to punish others experienced increases, the number of people using systems development methodologies in an IS department decreases. This may be attributed to an “unpleasant” working environment that is created by such power being experienced.

However, it can be noted that there were no significant relationships between the widely use of systems development methodologies and the perceived individual power, an organisation empowering people at all levels, power being concentrated in the hands of a

select few, an organisation teaching people to leverage their full power, power being misused by top leaders in an organisation, individual exercise of power – power of position, individual exercise of power – power of relationships, individual exercise of power – power of expertise, type of power experienced – power of position, type of power experienced – power of relationships, type of power experienced – power of information, type of power experienced – power to reward others, systems development methodologies helping managers to gain control over team members and systems development methodologies enslaving systems developers.

In summary it is evident that the type of power exercised, specifically the power of charisma, power of information, power to reward others and the type of power experienced, specifically the power of charisma, power of expertise, have a positive influence on the number of people using systems development methodologies and the number of projects developed using systems development methodologies. However, the power to punish others, whether exercised or experienced has a negative influence on the number of people using systems development methodologies within an IS department and the number of projects developed using systems development methodologies.

For the correlation between the strictness of systems development methodology used and the perceived individual power, the use of power in the organisation, the type of power exercised, the type of power experienced, the control by systems development methodologies and the enslavement by systems development methodologies. When the analysis was done, all significant correlations between questions were indicated by a superscript * in the results table. These were selected for reporting. The results are recorded in table 5.11:

Table 5.11: Correlations between the strictness of SDM used and the perceived individual power, the use of power in the organisation, the type of power exercised, the type of power experienced, the control by SDMs and the enslavement by SDMs

		Strictness of SDM used
		Correlation coefficients
		Question 10
Perceived individual power	Ques17.1	-.174*
Use of power in organisations	Ques 18.1 (Organisation empowers people at all levels)	.104
	Ques 18.2 (Power is concentrated)	-.012
	Ques 18.3 (Organisation rewards leaders for leveraging power)	.096
	Ques 18.4 (Organisation teaches leadersto leverage full power)	.106
	Ques 18.5 (Power is misused)	-.072
Type of power exercised	Ques 19.1 (Power of position)	-.048
	Ques 19.2 (Power of charisma)	-.023
	Ques 19.3 (Power of relationships)	-.072
	Ques 19.4 (Power of information)	.034
	Ques 19.5 (Power of expertise)	-.027
	Ques 19.6 (Power to punish others)	.036
	Ques 19.7 (Power to reward others)	.104
Type of power experienced	Ques 20.1 (Power of position	-.114
	Ques 20.2 (Power of charisma)	.043
	Ques 20.3 (Power of relationships)	-.009
	Ques 20.4 (Power of information)	.001
	Ques 20.5 (Power of expertise)	-.050
	Ques 20.6 (Power to punish others)	-.106
	Ques 20.7 (Power to reward others)	.122
Control by SDM	Ques 12.5 (SDM helps managers gain control)	-.123
Enslavement by SDM	Ques 12.6 (SDM enslaves systems developers)	-.180*

It can be noted that there were only 2 significant relationships between strictness of systems development methodology used and perceived individual power (-.174*) and the question of systems development methodologies enslaving systems developers (-.180*). Both relationships were negative weak relationships. This means as the strictness of systems development methodologies increase, the perceived individual power and the enslavement of systems developers by systems development methodologies decreases. This strictness of use may mean that the creativity of the individuals is reduced hence

“inhibiting”. The decrease in the enslavement of systems developers as the strictness of systems development methodologies used increase may be attributed to the “guidance” provided through the strictness of use. Depending on the educational level of the systems developer, the beginners might deem the strictness of use crucial to the development of skills needed to effectively use systems development methodologies in developing projects. Therefore as the strictness of use increase so does the “guidance”. Instead of enslaving, systems development methodologies will be “enlightening”.

For the correlation between the future use of SDM and the perceived individual power, the use of power in the organisation, the type of power exercised, the type of power experienced, the control by systems development methodologies and the enslavement by systems development methodologies. When the analysis was done, all significant correlations between questions were indicated by a superscript * in the results table. These were selected for reporting. The results are recorded in table 5.12:

Table 5.12: Correlations between the future use of systems development methodologies and the perceived individual power, the use of power in the organisation, the type of power exercised, the type of power experienced, the control by SDMs and the enslavement by SDMs

		Future use of SDMs
		Correlation coefficients
		Question 11
Perceived individual power	Ques17.1	.101
Use of power in organisations	Ques 18.1 (Organisation empowers people at all levels)	-.194*
	Ques 18.2 (Power is concentrated)	.128
	Ques 18.3 (Organisation rewards leaders for leveraging power)	.008
	Ques 18.4 (Organisation teaches leaders to leverage full power)	.152
	Ques 18.5 (Power is misused)	.106
Type of power exercised	Ques 19.1 (Power of position)	.123
	Ques 19.2 (Power of charisma)	.197*
	Ques 19.3 (Power of relationships)	.085
	Ques 19.4 (Power of information)	.068
	Ques 19.5 (Power of expertise)	.280*
	Ques 19.6 (Power to punish others)	.098
	Ques 19.7 (Power to reward others)	.090
Type of power experienced	Ques 20.1 (Power of position	.235*
	Ques 20.2 (Power of charisma)	.126
	Ques 20.3 (Power of relationships)	-.053
	Ques 20.4 (Power of information)	.018
	Ques 20.5 (Power of expertise)	.047
	Ques 20.6 (Power to punish others)	.087
	Ques 20.7 (Power to reward others)	.070
Control by SDM	Ques 12.5 (SDM helps managers gain control)	.264*
Enslavement by SDM	Ques 12.6 (SDM enslaves systems developers)	.093

It can be noted that there was a significant negative weak relationship between future use of systems development methodologies and the question of organisations empowering people at all levels (-.194*). This means as the future use of systems development methodologies increase, the empowerment of people at all levels by organisations decreases. This may be attributed to the culture of the organisations. Future use of systems development methodologies might mean the empowerment of others and the

enslavement of others depending on the roles they find themselves performing within their organisations.

It can be noted that there was a significant positive weak relationship between the type of power exercised – power of charisma and the future use of systems development methodologies (.197*). This means as the power of charisma exercised increases, so does the future use of systems development methodologies. This may be attributed to the influence generated by the leader's style or persona.

It can be noted that there was a significant positive moderate relationship between the future use of systems development methodologies and the type of power exercised – power of expertise (.280*). This may be attributed to more expertise being needed to effectively implement the future use of systems development methodologies.

It can be noted that the type of power experienced – power of position has a significant positive moderate relationship with the future use of systems development methodologies (.235*). This means as the power of position exercised increase, so does the future use of systems development methodologies. This may be attributed to the formal authority derived from the person's title or position in an organisation. It means the titles are important for future use of systems development methodologies. This may also be linked to job responsibilities that come with the titles. Knowing who does what is important for the future use of systems development methodologies.

It can be noted that there was a significant positive moderate relationship between the future use of systems development methodologies and the questions of systems development methodologies helping managers gain control over team members. This means that managers will continue to benefit from gaining control over team members through the use of systems development methodologies.

In summary, it is evident that the individual exercise of power – power of charisma and power of expertise has a positive link with the future use of systems development methodologies, meaning that leaders will still need to improve and use the influence that is derived from their leadership style or persona. Systems development methodologies will continue to help managers gain control over team members through the future use of systems development methodologies. In this section we have been addressing research objective 4a: Determine the relationship between power and systems development

methodologies' use. We are now going to address research objective 4b: Determine the relationship between power and success of systems development methodologies.

Research objective 4b - Determine the relationship between power and success of systems development methodologies.

The success of systems development methodologies is expressed by support provided by SDM as control technology, the quality of the development process followed, and the quality of the product (system). As mentioned above, power is addressed by the perceived individual power, the use of power in the organisation, the type of power an individual exercises, the type of power an individual experiences, and the type of power an individual would like to leverage in future.

In order to address the above research objective we will report the correlations that exist between the following:

- The correlation between **the support provided by systems development methodologies as control technology** and the perceived individual power, the use of power in the organisation, the type of power exercised, the type of power experienced, the control by systems development methodologies and the enslavement by systems development methodologies.
- The correlation between **the quality of the development process followed** and the perceived individual power, the use of power in the organisation, the type of power exercised, the type of power experienced, the control by systems development methodologies and the enslavement by systems development methodologies.
- The correlation between **the quality of the product (system)** and the perceived individual power, the use of power in the organisation, the type of power exercised, the type of power experienced, the control by systems development methodologies and the enslavement by systems development methodologies.

For the correlation between the support provided by systems development methodologies as control technology and the perceived individual power, the use of power in the organisation, the type of power exercised, the type of power experienced, the control by systems development methodologies and the enslavement of systems development methodologies. When the analysis was done, all significant correlations between questions

were indicated by a superscript * in the results table. These were selected for reporting. The results are recorded in table 5.13 below:

Table 5.13: Correlations between the support provided by systems development methodologies as control technology and the perceived individual power, the use of power in the organisation, the type of power exercised, the type of power experienced, the control by systems development methodologies and the enslavement by systems development methodologies.

		Support provided by SDM as control technology	
		Correlation coefficients	
		A SDM helps to decompose the system Ques 12.1	Support_control _technology
Perceived individual power	Ques17.1	-.159	.049
Use of power in organisations	Ques 18.1 (Organisation empowers people at all levels)	-.017	-.001
	Ques 18.2 (Power is concentrated)	.055	.016
	Ques 18.3 (Organisation rewards leaders for empowering their people)	-.061	-.072
	Ques 18.4 (Organisation teaches leaders to leverage full power)	-.055	-.162*
	Ques 18.5 (Power is misused)	.006	-.142
Type of power exercised	Ques 19.1 (Power of position)	.180*	.117
	Ques 19.2 (Power of charisma)	.105	.149
	Ques 19.3 (Power of relationships)	.062	.139
	Ques 19.4 (Power of information)	.114	.442*
	Ques 19.5 (Power of expertise)	.087	.253*
	Ques 19.6 (Power to punish others)	-.072	-.206*
	Ques 19.7 (Power to reward others)	.073	-.052
Type of power experienced	Ques 20.1 (Power of position	-.032	.027
	Ques 20.2 (Power of charisma)	.187*	.085
	Ques 20.3 (Power of relationships)	.046	-.003
	Ques 20.4 (Power of information)	.189*	.107
	Ques 20.5 (Power of expertise)	.093	.161
	Ques 20.6 (Power to punish others)	-.115	.099
	Ques 20.7 (Power to reward others)	.039	-.061
Control by SDM	Ques 12.5 (SDM helps managers gain control)	.000	.264*
Enslavement by SDM	Ques 12.6 (SDM enslaves systems developers)	.000	.212*

It can be noted that there was a significant negative weak relationship between support provided by systems development methodologies as control technology and the question of organisations teaching leaders to leverage their full power (-.162*). This means as the support provided by systems development methodologies as control technology increase, the question of organisations teaching leaders to leverage their full power will decrease. This may be attributed to the benefits derived from the support as a control technology such that the need for organisations to teach leaders to leverage full power will be limited if not eliminated.

It can be noted that the type of power exercised – power of position had a significant positive weak relationship with systems development methodologies helping to decompose the system to be developed into workable parts (.180*). This means as the power of position exercised increase, support offered by systems development methodologies to decompose a system will also increase. This may be attributed to the formal authority derived from a person's title on how things should be done.

It can be noted that the type of power exercised – power of information, had a significant positive strong relationship with the support provided by systems development methodologies as control technology (.442*). This means that as the power of information exercised increase, so does the support provided by systems development methodologies as control technology. This may be attributed to the increase in the need of information or evidence required to effectively make use of systems development methodologies and in turn obtain the benefit of support as control technology.

It can be noted that the type of power exercised - power of expertise had a significant positive moderate relationship with the support provided by systems development methodologies as control technology (.253*). This may be attributed to the increase in the need of expertise knowledge in order to effectively utilise the benefits derived from the use of systems development methodologies, specifically the support provided by systems development methodologies as control technology.

It can be noted that the type of power exercised – power to punish others had a significant negative moderate relationship with the support provided by systems development methodologies as control technology (-.206*). This means that if the use of systems

development methodologies is forced on others through the power to punish, the benefit of support as control technology will not be fully realised.

It can be noted the type of power experienced – power of charisma had a significant positive weak relationship with the question of systems development methodologies helping to decompose the system to be developed in workable parts (.187*). This may be attributed to the influence generated by the leader's style or persona. As the power of charisma is experienced more, the benefit of systems development methodologies helping to decompose a system into workable parts will also be experienced more.

It can be noted that the type of power experienced – power of information had a significant positive weak relationship with systems development methodologies helping to decompose the system to be developed in workable parts (.189*). This may be attributed to information bringing the much needed knowledge in order to effectively derive this stated benefit.

It can be noted that the support provided by systems development methodologies as control technology had a significant positive moderate relationship with the question of systems development managers gaining control over team members (.264*). This means managers are indeed using systems development methodologies to gain control over team members and this is turn is increasing the support as control technology offered by systems development methodologies.

It can be noted that the support provided by systems development methodologies as control technology had a significant positive moderate relationship with the question of systems development methodologies enslaving systems developers (.212*). This may be attributed to the use of systems development methodologies "limiting" in a way the creativity and "independence" of systems developers. The controlling element of systems development methodologies may be perceived to be "inhibiting" the skills and potential of systems developers.

In summary, it is evident that systems development methodologies help decompose a system to be developed into workable parts and provide support as control technology. Systems development methodologies are helping managers gain control over team

members. However, the use of systems development methodologies, in a way "restricts" systems developers.

For the correlation between **the quality of the development process followed** and the perceived individual power, the use of power in the organisation, the type of power exercised, the type of power experienced, the control by systems development methodologies and the enslavement of systems development methodologies. When the analysis was done, all significant correlations between questions were indicated by a superscript * in the results table. These were selected for reporting. The results are recorded in table 5.14 below:

Table 5.14: Correlations between the quality of the development process followed and the perceived individual power, the use of power in the organisation, the type of power exercised, the type of power experienced, the control by systems development methodologies and the enslavement by systems development methodologies.

		Quality of the development process
		Correlation coefficients
		Quality_process
Perceived individual power	Ques17.1	.149
Use of power in organisations	Ques 18.1 (Organisation empowers people at all levels)	.077
	Ques 18.2 (Power is concentrated)	-.095
	Ques 18.3 (Organisation rewards leaders for empowering their people)	-.259*
	Ques 18.4 (Organisation teaches leaders to leverage full power)	-.097
	Ques 18.5 (Power is misused)	-.158
Type of power exercised	Ques 19.1 (Power of position)	-.111
	Ques 19.2 (Power of charisma)	.117
	Ques 19.3 (Power of relationships)	.088
	Ques 19.4 (Power of information)	.164*
	Ques 19.5 (Power of expertise)	.082
	Ques 19.6 (Power to punish others)	-.100
	Ques 19.7 (Power to reward others)	-.103
Type of power experienced	Ques 20.1 (Power of position	-.027
	Ques 20.2 (Power of charisma)	-.088
	Ques 20.3 (Power of relationships)	.063

	Ques 20.4 (Power of information)	-.004
	Ques 20.5 (Power of expertise)	.083
	Ques 20.6 (Power to punish others)	-.147
	Ques 20.7 (Power to reward others)	.026
Control by SDM	Ques 12.5 (SDM helps managers gain control)	.001
Enslavement by SDM	Ques 12.6 (SDM enslaves systems developers)	-.087

It can be noted that the quality of the development process had only 2 significant relationships. The first being a negative moderate relationship with the question of organisations rewarding leaders for empowering their people (-.259*). The second being a positive weak relationship with the type of power exercised – power of information (.164*). As the quality of the development process increase, the question of organisations rewarding their leaders for empowering their people decreases. This may be attributed to the culture of the organisation upon realising that a standard has already been established which leaders are merely following or enforcing on subordinates, hence no need to continuously reward. As the quality of the development process increase, so does the need to exercise power of information. This may be attributed to the need to maintain the quality of the developed process through communication and providing regular timely updates.

It is evident that the quality of the development process is directly linked to the type of power exercised – power of information. However, it has an inverse relationship with the question of organisations rewarding leaders for empowering their people.

For the correlation between **the quality of the product (system)** and the perceived individual power, the use of power in the organisation, the type of power exercised, the type of power experienced, the control by systems development methodologies and the enslavement of systems development methodologies. When the analysis was done, all significant correlations between questions were indicated by a superscript * in the results table. These were selected for reporting. The results are recorded in table 5.15 below:

Table 5.15: Correlations between the quality of the product (system) and the perceived individual power, the use of power in the organisation, the type of power exercised, the type of power experienced, the control by systems development methodologies and the enslavement by systems development methodologies.

		The quality of the product (system)
		Correlation coefficients
		Quality_product
Perceived individual power	Ques17.1	.047
Use of power in organisations	Ques 18.1 (Organisation empowers people at all levels)	.305*
	Ques 18.2 (Power is concentrated)	-.205*
	Ques 18.3 (Organisation rewards leaders for leveraging power)	-.074
	Ques 18.4 (Organisation teaches leadersto leverage full power)	.107
	Ques 18.5 (Power is misused)	-.309*
Type of power exercised	Ques 19.1 (Power of position)	-.207*
	Ques 19.2 (Power of charisma)	.083
	Ques 19.3 (Power of relationships)	.133
	Ques 19.4 (Power of information)	.204*
	Ques 19.5 (Power of expertise)	.170*
	Ques 19.6 (Power to punish others)	-.095
	Ques 19.7 (Power to reward others)	-.092
Type of power experienced	Ques 20.1 (Power of position	-.096
	Ques 20.2 (Power of charisma)	.008
	Ques 20.3 (Power of relationships)	.151
	Ques 20.4 (Power of information)	-.018
	Ques 20.5 (Power of expertise)	.185*
	Ques 20.6 (Power to punish others)	-.140
	Ques 20.7 (Power to reward others)	.130
Control by SDM	Ques 12.5 (SDM helps managers gain control)	-.057
Enslavement by SDM	Ques 12.6 (SDM enslaves systems developers)	-.251*

It can be noted that the quality of the product had a significant positive moderate relationship with the question of organisations empowering people at all levels (.305*). This means as the empowerment of people at all levels by the organisation increase, so does the quality of the product. This may be attributed to the feeling of being liberated, hence unleashing creativity and commitment, which results in increased quality of the product.

It can be noted that the quality of the product had significant negative moderate relationships with power being concentrated in the hands of a few select individuals (.-205*) and power being misused in organisations (-.309*). This means as the concentration

of power increases, the quality of the product decreases, this may be attributed to the “restrictive” environment created by centralization of power in organisations. This also means as the misuse of power increases, the quality of the product decreases.

It can be noted that the quality of the product had a significant negative moderate relationship with the type of power exercised – power of position (-.207*). This means as the power of position exercised increase, the quality of the product decrease. This may be attributed to the issue of being felt to “be in charge” and creating an environment which is not conducive for the development of a good quality product.
It can be noted that the quality of the product had a significant positive moderate relationship with the type of power exercised - power of information (.204*). This means as the power of information exercised increases, so does the quality of the product. Sharing of relevant crucial and timely information is necessary for the development of a good quality product. This is also in line with the power of expertise exercised and experienced which had significant positive weak relationships with the quality of the product (.170*) and (.185*) respectively. Power of expertise exercised is necessary in communicating specialized knowledge needed to improve or enhance the quality of the product.

In summary, the quality of the product is positively influenced by organisations empowering people at all levels, power of information exercised, power of expertise exercised and experienced. However, the concentration of power and misuse of power in organisations have negative effects on the quality of the product.

The power of expertise is the influence that comes from developing and communicating specialized knowledge or the perception of knowledge. How this type of power is utilised together with organisational policies will determine who has the final decision making power. If this is translated to the decision of whether to use systems development methodologies or not and the type of systems development methodologies to use, then it has a direct impact on the success of the systems development methodologies. This means the use and success of systems development methodologies is to an extent linked to power. The use of systems development methodologies stipulates how things are to be done hence limiting the creativity of systems developers. However, the contingent uses of systems development methodologies is allowing systems developers a certain degree of “liberty”.

5.1.1 Additional results

Apart from the above, some additional results were obtained. In order to investigate further, we tried to answer the following questions:

- What factors influence the perceptions of the respondents regarding systems development methodologies helping managers gain control over team members?
- What factors influence the perceptions of the respondents regarding systems development methodologies enslaving systems developers?
- Are there any differences between the perception of power for traditional and agile systems development methodologies?
- Are there any differences between the perception of power amongst systems developers and managers?

On what factors influence the perceptions of the respondents regarding systems development methodologies helping managers gain control over team members? A regression analysis was done and the results are detailed in table 5.16 below:

Table 5.16 Coefficients for dependent variable question 12.5 (SDMs helping managers gain control over team members)

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
2	(Constant)	-.690	.597		-1.155	.281
	Ques 18.4 (leaders leveraging full power)	1.021	.190	.783	5.371	.001
	Ques 7.2 (traditional SDMs – Information Engineering)	.556	.178	.456	3.128	.014

a. Dependent Variable: Ques 12.5 (SDMs helping managers gain control over team members)

The results of the regression analysis on systems development methodologies helping managers gain control over team members revealed an increase in correlation when the predictors' organisations teaching leaders to leverage their full power and the use of traditional systems development methodologies were added to it. This shows a strong link between managers gaining control over team members and organisations actually allowing and encouraging managers to leverage their full power and the use of traditional systems methodologies facilitates this. Traditional systems development methodologies are process centric and follow an autonomous disciplined approach. Managerial decision making is at the realm.

On what factors influence the perceptions of the respondents regarding systems development methodologies enslaving systems developers? A regression analysis was done and the results are detailed in table 5.17 below:

Table 5.17 Coefficients of dependent variable question 12.6 (SDMs enslaving systems developers)

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
3	(Constant)	3.369	.615		5.477	.001
	Ques 20.3 (types of power experienced – power of relationships)	-.648	.128	-.690	-5.064	.001
	Ques 19.1 (individual exercise of power – power of position)	.950	.217	1.000	4.382	.003
	Ques 20.6 (types of power experienced – power to punish others)	-.545	.210	-.593	-2.594	.036

a. Dependent Variable: Ques 12.6 (SDMs enslaving systems developers)

The regression analysis results for systems development methodologies enslaving systems developers also revealed an increase in correlation when the predictors, power of position and the power to punish others were added to it. This means that the use of traditional systems development methodologies to an extent “enslaves” systems developers. However, the contingent use of systems development methodologies, especially agile systems development methodologies “liberates” systems developers.

On are there any differences between the perception of power for traditional and agile systems development methodologies? A t-test was performed and the results are detailed in table 5.18:

Table 5.18: Mean values and effect sizes for traditional SDMs

Questions	Using traditional systems development methodologies (mean values)	**Not** using traditional systems development methodologies (mean values)	Effect size	Interpretation
Quality of process	3.4	3.7	0.32	Medium effect
Ques 12.1 (SDMs help to decompose a system)	4.3	4.1	0.36	Large effect
Ques 12.6 (SDMs enslave systems developers)	2.8	3.2	0.33	Medium effect

The results of the t-test showed that those not using traditional systems development experience the quality of process more than those using traditional systems development methodologies. This may be attributed to the process centric nature of traditional systems development methodologies. The view of systems development methodologies helping to decompose a system to be developed in workable parts is experienced to a large extent by those using traditional systems development methodologies. This may be attributed to the pre-planned step by step approach followed by traditional systems development methodologies. The results also showed that those not using traditional systems development methodologies perceived the “enslavement” of systems development methodology to a greater extent as compared to those using traditional systems development methodologies. This may be attributed to the different qualifications and personality types of the respondents. Some might feel that they need the guidance offered by traditional systems development methodologies and hence they will not feel enslaved by their use, whereas some who are experienced might feel they need the liberty to be creative and find the use of systems development methodologies limiting them.

A t-test was also performed for those using agile systems development methodologies and those not using agile systems development methodologies. A summary of the results in detailed in table 5.19:

Table 5.19: Mean values and effect sizes for Agile SDMs

Questions	Using agile systems development methodologies (mean values)	**Not** using agile systems development methodologies (mean values)	Effect size	Interpretation
Ques 19.1 (power exercised – power of position)	3.4	3.9	0.63	Large
Ques 20.5 (power experienced – power of expertise)	4.5	4.9	0.61	Large
Ques 12.5 (SDMs help managers gain control)	3.7	4.2	0.55	Large

The t-test results show that those using agile systems development methodologies exercise the power of position to a lesser extent than those not using agile systems development methodologies. This may be attributed to managers are viewed as facilitators when using agile systems development methodologies. The results show that the type of power experienced – power of expertise is higher for those not using agile systems development methodologies as compared to those using agile systems development methodologies. This may be attributed to the constant need to have specialized skills by those not using agile systems development methodologies. The results also show that those not using agile systems development methodologies perceive to a greater extent that systems development methodologies help managers gain control over team members as compared to those using agile systems development methodologies. This may also be attributed to the command and control nature of other systems development methodologies which are not agile systems development methodologies.

On are there any differences between the perception of power amongst systems developers and managers? A t-test was performed on the roles assumed by the respondents at their workplaces. These roles were split into 2 distinct groups, the “manager” role group and the “other” role group. A summary of the results is detailed in table 5.20:

Table 5.20: Mean values and effect sizes for the role of respondent at work

Questions	Role : Manager (mean values)	Role: Other (mean values)	Effect size	Interpretation
Ques 19.1 (type of power exercised – power of position)	3.6	3.3	0.32	Medium
Ques 19.2 (type of power exercised- power of charisma)	4.1	3.8	0.36	Large
Ques 19.7 (type of power exercised – power to reward)	4.1	3.6	0.54	Large
Ques 20.7 (type of power experienced – power to reward others)	3.7	3.2	0.50	Large
Ques 12.5 (SDMs helps managers gain control)	3.9	3.6	0.36	Large

The results show that managers exercise the power of position more than non-managers. This may be attributed to the power embedded in their management role at work. The results also show that managers exercise the power of charisma at work more than non-managers. This may be attributed to the need by managers to generate influence to non-managers at work. The power to reward others exercised by managers at work was high as compared to that of non-managers. This may be attributed to the need to constantly motivate others at work by managers. The results also showed that managers were experiencing the power to reward others from their superiors more than the non-managers. This may be attributed to the role assumed, organisational reward structures and recognition awarded to people in management positions. The results also show that systems development methodologies are helping managers to gain more control over team members as compared to non-managers. This may be attributed to the guidance and benefits derived from the use of systems development methodologies.

The results of the nonparametric correlations (Spearman's rho) on a systems development methodology helping managers to gain control over team members revealed a negative correlation with the project outcome and organisation empowering people at all levels. This means that as the control gained by managers over team members increases, the project outcome might decrease, leading to projects not being completed and implemented for use. As the control of managers over team members increases, the empowering for all people at all levels in an organisation will eventually decrease. This will lead to power being concentrated in the hands of a select few individuals, as indicated by the positive correlation between systems development methodologies helping managers gain control

over team members and power being concentrated in the hands of a select few in an organisation. Research results also revealed that agile systems development methodologies were being widely and intensively used to develop projects. This may be attributed to the perception that agile systems development methodologies enhance flexibility and managers are viewed as facilitators hence liberating. They encourage pluralist decision making and are adaptable. This can be linked to “empowerment” on the part of systems developers. Traditional systems development methodologies enforce command and control. The manager is viewed as a planner and managerial decision making is followed. Projects developed using traditional systems development methodologies are pre-planned and a disciplined approach is followed. This can be linked to “enslavement” on the part of systems developers.

Conclusion

The main aim of this research was to study the influence of power on the success of systems development methodologies. In order to effectively reach this aim the following research goals were highlighted in chapter 1 and addressed in this chapter:

1. Systems development methodology use – Describe the current situation with regards to systems development methodology use in South Africa.
2. Determine the effectiveness of systems development methodologies in South Africa.
3. Determine the perception of developers with regards to systems development methodologies and power.
4. Determine relationships between:
    a) Power and systems development methodology use.
    b) Power and success of systems development methodologies.

It is evident that systems development methodologies are being used to develop systems projects, as noted by the intensity, widely usage, strictness and perceived future use of systems development methodologies. Systems development methodologies are effective as witnessed by the support as control technology they provide, the increased quality of the process followed, the increased quality of the product as well as the favourable project outcomes. Various types of power can be exercised and experienced at the workplace, these range from the power of position, power of charisma, power of relationships, power

of information, power of expertise, power to punish and reward others. Systems development methodologies help managers gain control over team members and limit to an extent the creativity of systems developers, however, systems developers are neutral when it comes to the question of being “enslaved” by systems development methodologies. There is a relationship between power and the use of systems development methodologies. As the misuse and centralization of power increases in organisations, the effectiveness of systems development methodologies is affected negatively. There is a relationship between power and success of systems development methodologies. The support provided by systems development methodologies, the quality of the development process followed and the quality of the product (system) is increased if power is handled correctly in organisations.

5.2 Limitations of the study

Due to time and financial constraints, the researcher had to work with a survey size of 153 respondents, it would have been ideal to increase the sample size. The culture and business area of an organisation to an extent, determines the rewards and power structures for IT professionals. Other factors such as remuneration structures, working hours, types of employment contracts, basic conditions of enrolment, also play a role and were not included in this research. Hence the type of power exercised at work with particular reference to the power to reward and punish others at work could not be explored in greater depth. Personality traits of systems developers and managers could only be explored theoretically. The quantitative analysis of the personality traits was not included in the research.

5.3 Future work

The researcher wishes to incorporate the organisational politics and culture, reward and reporting structures in further exploring the topic of power and success of systems development methodologies. This will provide the much needed insight and widen the research base. Quantifying the effect of personality traits on the perception of power would also help to in establishing a relationship, if any, between the success and use of power in the use of systems development methodologies. It would also help to analyse, if the personality traits are linked in a way to the reward structures, being a motivational factor in successfully deploying projects; through the use of systems development methodologies.

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Appendix A

Questionnaire

Please indicate your selection with an (X)

Section A: Background information

1. What is your primary role in systems development?	
1.1) Chief Information Officer	1
1.2) Project manager	2
1.3) Team leader	3
1.4) Systems architect	4
1.5) Business Analyst	5
1.6) Business Intelligence Analyst	6
1.7) Programmer	7
1.8) Other, please specify …… ……	8

2. Please indicate the highest qualification that you have obtained.	
2.1) Senior certificate (High school)	1
2.2) Certificate or diploma	2
2.3) University or technicon degree	3
2.4) Honors or Masters degree	4
2.5) PhD degree	5
2.6) Other, please specify …… ……	

3. What is your personal experience in systems development?	
3.1) None	1
3.2) Less than 1 year	2
3.3) 1 - 2 years	3
3.4) 3 - 5 years	4
3.5) 5 -10 years	5
3.6) More than 10 years	6

4. What is the total number of people employed in your Organisation's I.S department [at all locations]	
4.1) 1-5	1
4.2) 6-50	2
4.3) 51-100	3
4.4) 101-150	4
4.5) 151-200	5
4.6) More than 200	6

5. What is the core business area of your organisation?	
5.1) Manufacturing	1
5.2) Mining	2
5.3) Software development	3
5.4) Insurance	4
5.5) Retail	5
5.6) Banking and Finance	6
5.7) Education	7
5.8) Other, please specify …… …… ……	8

6. Are you using any Systems Development Methodologies? For the purposes of this research, the following definition is going to be used: A methodology is viewed as consisting of a philosophy, method, process model, tools and techniques. It provides a framework which serves the purpose of guiding the process of developing an information system. Examples include but are not limited to STRADIS, SSADM, RUP, ETHICS, SCRUM, XP, and IE.

	Yes	No

If **NOT**, please provide reasons for not using any Systems Development Methodologies on the space provided below and proceed to section D on page7.

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Section B:

7. To what extent is your IS department using the following standard *(commercial)* Systems Development Methodologies at present? On a scale 1 - 5, 1 being nominally and 5 being intensively.

Please note that you may mark more than one item for this question, if your IS department is using more than 1 standard (commercial) Systems Development Methodologies listed below.

	Nominally				Intensively
7.1) STRADIS (Structured Analysis, Design and Implementation of Information Systems)	1	2	3	4	5
7.2) IE (Information Engineering)	1	2	3	4	5
7.3) ETHICS (Effective Technical and Human Implementation of Computer-based Systems)	1	2	3	4	5
7.4) SSM (Soft Systems Methodology)	1	2	3	4	5
7.5) RAD (Rapid Application Development)	1	2	3	4	5
7.6) OOSE (Object Oriented Software Engineering by Jacobson)	1	2	3	4	5
7.7) RUP	1	2	3	4	5
7.8) XP	1	2	3	4	5
7.9) SCRUM	1	2	3	4	5
7.10) Other, please specify …… …… ……	1	2	3	4	5

8. How many people are using the Systems Development Methodology (s) in your IS Department?	
8.1) 1 - 5	1
8.2) 6 - 50	2
8.3) 51 - 100	3
8.4) 101 - 150	4
8.5) 151 - 200	5
8.6) More than 200	6

9. How many projects are developed using the Systems Development Methodology?	
9.1) 1-10	1
9.2) 11-20	2
9.3) 21-30	3
9.4) More than 30	4

10. Which of the following best describes how your IS department make use of its systems development methodology?	
10.1) A general guideline for all projects.	1
10.2) Adapted on a project-to-project basis.	2
10.3) A standard which is followed rigorously for all projects.	3
11. What are your expectations for the use of systems development methodologies in your IS department in the next two years?	
11.1) Make more use of our systems development methodology.	1
11.2) Replace our systems development methodology.	2
11.3) Supplement our systems development methodology with other methodologies.	3
11.4) Abandon the use of our systems development methodology.	4
11.5) No change.	5
11.6) Other, please specify …… …… ……	6

Section C:

12. To what extent do you agree with the following statements? On a scale 1 – 5, 1 being totally disagree and 5 being totally agree.

	Totally disagree				Totally agree
12.1) A systems development methodology helps to decompose the system to be developed in workable parts.	1	2	3	4	5
12.2) A systems development methodology helps to estimate the size of the system to be developed.	1	2	3	4	5
12.3) A systems development methodology helps to estimate the time and effort required for the development of a planned system.	1	2	3	4	5
12.4) A systems development methodology helps to plan systems development projects.	1	2	3	4	5
12.5) A systems development methodology helps managers gain control over team members.	1	2	3	4	5
12.6) A systems development methodology enslaves systems developers.	1	2	3	4	5
12.7) A systems development methodology helps in defining useful milestones for our systems development projects.	1	2	3	4	5
12.8) A systems development methodology helps to organise systems development projects.	1	2	3	4	5
12.9) A systems development methodology helps to keep our systems development projects under control.	1	2	3	4	5
12.10) A systems development methodology helps to estimate the project risks.	1	2	3	4	5
12.11) Overall, a systems development methodology helps us to manage our systems development projects.	1	2	3	4	5

Section D: Project outcomes

13. Please describe the last project you were involved in with regards to the following project characteristics:

13.1)Project description:

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…… …… …… …… …… …… …… …… …… ……

13.2) Project size(very small, small, medium, large, very large)	
13.3) Project duration (months)	
13.4) Project Cost (in ZAR)	ZAR
13.5) Systems development methodology used	

14. Which of the following best describes the outcome of the last systems development project you were involved with?	
14.1) The project was canceled/terminated before completion.	1
14.2) The project was completed but not implemented.	2
14.3) The project was completed and implemented, but is not in use anymore.	3
14.4) The project was completed and implemented, and is in use for ……..months. (Please specify)	4

15. To what extent do you agree with the following statements about the last project you were involved in? On a scale 1 – 5, 1 being 'totally disagree' and 5 being 'totally agree'

	Totally disagree				Totally agree
15.1) The project was completed on schedule.	1	2	3	4	5
15.2) The project was completed within the budget.	1	2	3	4	5
15.3) The developed system satisfied all the stated requirements.	1	2	3	4	5
15.4) The speed of developing the project was high.	1	2	3	4	5
15.5) The productivity of developers involved with the project was high.	1	2	3	4	5
15.6) The cost of the project is low when compared to the size and complexity of the system developed.	1	2	3	4	5
15.7) The project achieved its goals.	1	2	3	4	5
15.8) Overall, the project represents excellent work.	1	2	3	4	5

15.9) Overall, the project was a success.	1	2	3	4	5

16. To what extent do you agree with the following statements about the last project you were involved in? On a scale 1 – 5, 1 being 'totally disagree' and 5 being 'totally agree'.

	Totally disagree				Totally agree
16.1) The functionality of the developed system is high.	1	2	3	4	5
16.2) The reliability of the developed system is high.	1	2	3	4	5
16.3) The maintainability of the developed system is high.	1	2	3	4	5
16.4) The portability of the developed system is high.	1	2	3	4	5
16.5) The efficiency of the developed system is high.	1	2	3	4	5
16.6) The usability of the developed system is high.	1	2	3	4	5
16.7) The developed system meets user needs.	1	2	3	4	5
16.8) The documentation of the developed system is good.	1	2	3	4	5
16.9) Overall the quality of the developed system is high.	1	2	3	4	5
16.10) Overall, the users are satisfied with the developed system.	1	2	3	4	5
16.11) Overall, the developed system is a success.	1	2	3	4	5

Section E: Power in organisations

	Not at all powerful				Very powerful
17.1) How powerful do you think you are at work?	1	2	3	4	5

18. To what extent do you agree with the following statements about the use of power in your organisation? On a scale 1 – 5, 1 being 'totally disagree', 5 being 'totally agree'.

	Totally disagree				Totally agree
18.1) My organisation empowers people at all levels.	1	2	3	4	5
18.2) In my organisation, power is concentrated in the hands of a few select individuals.	1	2	3	4	5
18.3) My organisation rewards leaders for empowering their people.	1	2	3	4	5
18.4) My organisation teaches leaders how to leverage their full power.	1	2	3	4	5
18.5) Power is misused by top leaders in my organisation	1	2	3	4	5

19. To what extent do you leverage the following sources of power at work? On a scale 1 – 5, 1 being 'very little extent' and 5 being 'very great extent'.

	Very little extent				Very great extent
19.1) The power of position (is the formal authority that derives from a person's title or position in a group or an organisation).	1	2	3	4	5
19.2) The power of charisma (is the influence that is generated by a leader's style or persona).	1	2	3	4	5
19.3) The power of relationships (is the influence that leaders gain through their formal and informal networks both inside and outside of their organisations).	1	2	3	4	5
19.4) The power of information (is the control that is generated through the use of evidence deployed to make an argument).	1	2	3	4	5
19.5) The power of expertise (is the influence that comes from developing and communicating specialized knowledge (or the perception of knowledge)).	1	2	3	4	5
19.6) The power to punish others.	1	2	3	4	5
19.7) The power to reward others.	1	2	3	4	5

20. To what extent does your manager leverage the following sources of power at work? On a scale 1 – 5, 1 being 'very little extent' and 5 being 'very great extent'.

	Very little extent				Very great extent
20.1) The power of position (is the formal authority that derives from a person's title or position in a group or an organisation).	1	2	3	4	5
20.2) The power of charisma (is the influence that is generated by a leader's style or persona).	1	2	3	4	5
20.3) The power of relationships (is the influence that leaders gain through their formal and informal networks both inside and outside of their organisations).	1	2	3	4	5
20.4) The power of information (is the control that is generated through the use of evidence deployed to make an argument).	1	2	3	4	5
20.5) The power of expertise (is the influence that comes from developing and communicating specialized knowledge (or the perception of knowledge)).	1	2	3	4	5
20.6) The power to punish others.	1	2	3	4	5
20.7) The power to reward others.	1	2	3	4	5

20. What are the three sources of power most critical for you to leverage in the next 5 years? Indicate your three choices by inserting numbers 1,2,3 to rank according to criticality , 1 being 'most critical'.

21.1) The power of position (is the formal authority that derives from a person's title or position in a group or an organisation).	
21.2) The power of charisma (is the influence that is generated by a leader's style or persona).	
21.3) The power of relationships (is the influence that leaders gain through their formal and informal networks both inside and outside of their organisations).	
21.4) The power of information (is the control that is generated through the use of evidence deployed to make an argument).	
21.5) The power of expertise (is the influence that comes from developing and communicating specialized knowledge (or the perception of knowledge)).	
21.6) The power to punish others.	
21.7) The power to reward others.	

Thank you for your cooperation!