Investigating the impact of perceived work complexity, shared leadership on team performance of IT employees of South African firms

Christiaan Philippus Storm

16391561

A research submitted to the Gordon Institute of Business Science, University of Pretoria, in partial fulfilment of the requirements for the degree of Master of Business Administration.

6 November 2017

Abstract

The IS environment is riddled with difficulties rendering it complex in nature. It involves multiple interactions among elements, multiple actors, multiple actor roles, various degrees of freedom and multiple settings for distribution. Unfortunately, research has paid limited attention to finding the silver bullet that could manage complexity in systems, including IS systems. The complexity of IS, as well as the frequent changes to the agreed-upon requirements common in this environment, causes uncertainty. To improve our understanding of IT employees' perceived work complexity, this research drew on the constructs of shared leadership and team performance.

More specifically, the objective of this research study was to develop and test a model of how work complexity, as perceived by IT employees, influences their team performance, and the role that shared leadership plays. A new construct, perceived work complexity, was created. Two existing dimensions of team performance, namely effectiveness and efficiency, and three types of shared leadership, transformational, transactional and directive shared leadership, were studied. Shared leadership was hypothesised to positively predict team performance and negatively predict perceived work complexity, based on prior research. Perceived work complexity was also hypothesised to negatively predict team performance. Other factors, such as age and working at different locations, were also considered.

To test the research model a survey methodology was adopted. Data was collected from IT professionals in South Africa using an online questionnaire which was developed using existing literature and multi-item scales to operationalise the study's variables. Using a non-probability snowball sampling approach, the questionnaire was administered to IT employees who were invited to participate in the study. Data was collected over three months and a total of 204 useable responses from IT professionals in South Africa were collected.

After removing missing data, and checking for outliers, the data was subjected to confirmatory and exploratory factor analyses to ensure validity and reliably. First, an exploratory factor analysis to ensure unidimensionality was carried out; this was followed by a confirmatory factor analysis to prove the convergent and discriminant validity of the constructs. After proving the validity and reliability of the constructs, composite variables of the latent factors were created. Finally, hypothesised relationships were tested using structural equation modelling techniques to test the proposed model.

The final results showed that perceived work complexity negatively predicts team performance, and that shared leadership negatively predicts perceived work complexity and positively predicts team performance. Additional analyses suggested that perceived work complexity can be seen as either a mediator or moderator. Perceived work complexity partially mediated the effect, reducing it, that shared leadership has on team performance. The moderating effect of perceived work complexity showed that there is a significant positive relationship between shared leadership and team performance at high and low levels of perceived wok complexity. The study also showed that working at different locations increases perceived work complexity and that age reduces the perception of shared leadership.

The perceived work complexity phenomenon is important to both academia and IT management practice. By determining the extent to which perceived work complexity and shared leadership are important to team performance, this study adds to the growing body of knowledge on perceived work complexity and ways to resolve key IT management issues. The results have useful implications for practice.

Keywords

Perceived work complexity, shared leadership, team performance

Declaration

I declare that this research project is my own work. It is submitted in partial fulfilment of the requirements for the degree of Master of Business Administration at the Gordon Institute of Business Science, University of Pretoria. It has not been submitted before for any degree or examination in any other University. I further declare that I have obtained the necessary authorisation and consent to carry out this research.

Christiaan Storm

6 November 2017

Table of Contents

1 Introduction

For over a decade it has been recorded in various pieces of literature that information systems (IS) reliability, efficiency and availability has been a significant management issue, in 2013 it was ranked the sixth most important management issue globally (Luftman, Zadeh, Derksen, Santana, Rigoni, and Huang, 2013). Luftman et al. (2013) suggests that the reason behind this growing issue was due to the growing complexity of IS. Despite being the sixth most important issue, the failure rate of complex software development projects is also still high (Chen, Bharadwaj, and Goh, 2017). For example, Anderson and Dekker (2005) found that the complexity of IS as well as the agreed upon requirements, caused changes and the forecasted uncertainties about the performance and quality specifications of IT projects were associated with higher cost.

It has become apparent that IS are getting more complex as a result of structures and formalities that have developed over time (Nelson and Morris, 2014). The literature suggests that complexity can be shifted away from the complex environment itself to the interactions of team members (Baard, Rench, and Kozlowski, 2014), and that shared leadership can connect people within the organisation, which may reduce the perception of work complexity. Once the perception of complexity in the actual work is reduced, team performance will increase. Research shows that illusory patterns are formed by actors when they are faced with a random phenomena to restore some order to the world, which also prepares them to seek guidance and believe in any representation, even one based on tradition or superstition (Whitson and Galinsky, 2008).

This could be seen as somewhat logical, and is captured perfectly by the colloquial phrase “your perception is your reality”, and if the work feels and/or is perceived as less complex, there is reduced cognitive interference affecting throughput. This is because less cognitive energy is spent trying to create illusory patterns and create order to a seemingly random world (Floricel, Michela, and Piperca, 2016; Whitson and Galinsky, 2008).

The proposed study will focus on perceived work complexity, defined as the cognitive appreciation of the complexity of the work itself. It proposes that shared leadership leads to higher team performance by IT employees, as it reduces perceived work complexity.

1.1 The research problem

IS projects, such as software development, require extensive teamwork and high team performance. The environment is riddled with difficulties rendering it complex in nature. It involves multiple interactions among elements, multiple actors, multiple actor roles, various degrees of freedom and multiple settings for distribution (Leonardi, Bailey, Diniz, Sholler, and Nardi, 2016). Unfortunately, a silver bullet to managing complexity in systems, including IS, has received limited attention (Kerzner, 2013; Pucciarelli and Kaplan, 2016).

Research into IS projects has shown that some leadership styles correlate with work complexity and team performance (Espinosa, Slaughter, Kraut, and Herbsleb, 2007; Hoch and Kozlowski, 2014). Shared leadership is one such type of leadership style (Roepke, Agarwal, and Ferratt, 2000; Wang, Waldman, and Zhang, 2014). Shared leadership promotes mutual learning and knowledge sharing this is when work is more interdependent and knowledge-based, and as a result, this type of leadership negatively affects perceived work complexity (Shah, Cross, and Levin, 2015).

Research regarding the complexity of projects has produced two streams namely; “complexity in projects” and “complexity of projects” (Geraldi, Maylor, and Williams, 2011, p. 4). Both streams focus on the complexity of the system itself, and not on perceived work complexity. This study will propose that shared leadership can lessen perceived work complexity by connecting individuals who will assist each other in the work environment, thus increasing team performance. Shared leadership does this not by reducing the system's complexity, but by lowering the perceived complexity of the system.

In essence, the relationship between work complexity and team performance, work complexity and shared leadership, is a negative one. However, shared leadership has been shown to have a positive relationship with team performance; this is achieved by connecting individuals internally in the organisation (Metcalf and Benn, 2012). Shared leadership that connects individuals in teams can lower perceptions of complexity and increase team performance.

The research problem gives rise to the following questions:

- Can perceived complexity be measured using the subjective ratings of IT employees?

- To what extent do the dimensions of perceived work complexity influence team performance?
- To what extent does shared leadership influence perceived work complexity?
- To what extent does shared leadership influence perceived team performance?

1.1 Contribution to the body of knowledge

Research has shown that work complexity has a negative correlation with job performance (Wang, Tsai, and Tsai, 2014), shared leadership (Wang, Waldman et al., 2014). At the time of writing this proposal research could not be obtained which explained how perceived work complexity affects the team performance of IT employees, or the effects of shared leadership on perceived work complexity and team performance. This research will introduce a new construct of perceived work complexity and examine its relationship with team performance and shared leadership. Only four research studies were found that referenced the exact term "*perceived work complexity*" (Schwarz, Barros, Behnke, Chang, Christiansen, Faber, Kwon, Johnson-Mehta, Beal, MacDermid, and Weiss, 2004; Kemp, Wall, Clegg, and Cordery, 1983; Tian, 2013; Mattsson, Li, Fast-Berglund, and Gong, 2017). Scholarly work by Kemp et al. (1983), Tian (2013) and Mattsson et al. (2017) measured work complexity, and not perceived work complexity, using the degree of variety between constructs and not asking the respondents direct perceived work complexity questions, while Schwarz et al. (2004) merely made a search term reference to the phrase. This study focuses on these understudied constructs and makes a contribution towards the literature by increasing an understanding of the relationship of perceived work complexity with a number of other constructs.

By understanding the interrelationships between these constructs, managers of IS will be able to understand the importance of managing employees' perceived work complexity, thus gaining an opportunity to increase team performance. This could have practical application value in three ways. First, if perceived work complexity can influence team performance, managers can focus team efforts on reducing this perception, rather than on reducing the actual complexity of the work. i.e. allocating less efforts to reduce the intensity of information sharing and creative thinking required which has been shown to reduce work complexity (Wang, Waldman et al., 2014). Second, managers can use aspects of shared leadership, using concepts like mutual learning and knowledge sharing, to further reduce perceived work complexity. Lastly, managers can embed mutual learning and knowledge sharing techniques into the team's culture, enabling its members to leverage more knowledge from each other. Using shared leadership, leaders could link individuals in a team and reduce perceived work complexity, ultimately leading to increased team performance.

1.2 Structure of the report

Chapter 1 - introduction

This chapter presents the research problem with research objectives and the need for the research.

Chapter 2 - Literature Review

This chapter presents arguments for the need to understand the relationships between the constructs and draws on current academic literature to refine the research questions.

Chapter 3 - Research Hypotheses

In this chapter a precise purpose of the research is defined with a summary of measurable hypotheses that will be used in statistical procedures.

Chapter 4 - Research Methodology

This chapter provides a methodology to explore the dimension of the constructs and defends the use of statistical techniques used, which is followed by limitations.

Chapter 5 –Results Analysis

This chapter will present the data screening as well as the profile of participants. Results of the exploratory and confirmatory factor analysis are also presented. Finally, structural equation modelling (SEM) analysis are presented to test the formulated hypotheses. The reader's attention will be directed to key insights.

Chapter 6 –The Research Findings

The findings and the significance thereof will be discussed in this chapter. The outcomes of the research hypotheses as well as new postulations will be discussed.

Chapter 7 –Conclusion

This chapter will present implications for management, limitations of the research as well as suggestions for future research will be provided, based on the findings of this research.

2 Literature review

This chapter draws on the current academic literature and provides a review of the research into team performance, perceived work complexity and shared leadership. It argues for the need to understand the relationships between these constructs using the literature to support this. The review focuses on definitions, models and the theoretical underpinnings of the above-mentioned constructs.

2.1 Complexity theory

Differing perspectives of complex systems are considered in this section, drawing on published review papers (Rouse, 2007; Snowden and Boone, 007; Rouse and Serban, 2011). It is useful to note that different disciplines, in part due to the contexts in which they work, can have significantly varying views of complexity and complex systems.

It is useful to differentiate the notions of “complex system” and “system” (Rouse, 2003). A system is a combination or group of interacting, interrelated or interdependent elements that together form a collective entity. Elements may include behavioural, symbolic or physical entities. Elements may interact computationally, by exchange of information, and/or physically. Systems tend to have purposes/goals, which in some cases are ascribed from the outside by an observer of the system.

A complex system, on the other hand, is a system whose behaviours can be attributed to one or more of the following perceived complicated characteristics: there are a large number of relationships among elements, discontinuous and nonlinear relationships, uncertain characteristics of relationships and elements, and large numbers of elements. A system may be judged to be complex from a functional perspective if the underlying structural features are independent and complicated behaviours are present (Snowden and Boone, 2007).

This research draws on the classic work of Snowden and Boone (2007). The researchers proposed that complexity is more a “way of thinking about the world than a new way of working with mathematical models” (Snowden and Boone, 2007, p. 3). Snowden and Boone (2007), showed that a complex system has the following characteristics:

- “It involves large numbers of interacting elements” (Snowden and Boone, 2007, p. 3)
- “The interactions are nonlinear, and minor changes can produce disproportionately major consequences” (Snowden and Boone, 2007, p. 3)

- "The system is dynamic, the whole is greater than the sum of its parts" (Snowden and Boone, 2007, p. 3)
- "The system has a history, and the past is integrated with the present" (Snowden and Boone, 2007, p. 3)
- "The elements evolve with one another and with the environment" (Snowden and Boone, 2007, p. 3)
- "This evolution is irreversible" (Snowden and Boone, 2007, p. 3)
- "Though a complex system may, in retrospect, appear to be ordered and predictable, hindsight does not lead to foresight because the external conditions and systems constantly change" (Snowden and Boone, 2007, p. 3)
- "In a complex system the agents and the system constrain one another, especially over time" (Snowden and Boone, 2007, p. 3)

This researcher has observed software development of IS systems and found that they adhere to all eight of these criteria of a complex system. According to Snowden and Boone (2007), systems adhering to these criteria can be classified as either complex or complicated. Systems that can be understood using experts, data and relationship are not complex systems but complicated systems. This research will investigate whether complicated or complex systems have a relationship with team performance.

2.1.1 Perceived work complexity

A recent meta-analysis of work complexity showed that it can be measured using scale-based measurement, and using levels of knowledge-sharing and interdependence among team members (Wang, Waldman et al., 2014). Wang, Tsai et al. (2014) postulated that work complexity can be measured by the intensity of information-sharing and creative thinking required. This could be seen as aligning with parts of the Snowden and Boone (2007) postulation of complexity, particularly their statements, "It involves large numbers of interacting elements" and "The elements evolve with one another and with the environment" (Snowden and Boone, 2007, p. 3). Most other research surrounding complexity of systems focused on the mathematical model of complexity rather than the consciousness, or perception, of complexity (Geraldi, Maylor and Williams, 2011).

This review of the literature did not reveal existing scales that measure perceived work complexity aligning with Snowden and Boone's (2007) complexity theory and this researcher therefore developed a scale, based on Snowden and Boone (2007). (See Appendix 1 - Perceived complexity). Aligned with Snowden and Boone (2007), lower ratings in the scale indicate complicated systems, and higher ratings indicate that the system is more complex.

2.2 Team performance

Team performance is the dependent variable in this study. It is an important construct and has received much academic attention. A recent meta-analysis by D'Innocenzo, Mathieu, and Kukenberger (2016) showed that team performance can be measured in multiple ways and that it still deserves academic attention.

The extent of a team's ability to meet established quality, time and cost objectives can be defined as team performance (Hoegl and Gemuenden, 2001). A key issue in studying team performance is the perspective of the evaluator, as "project success depends, in part, on the perspective of the evaluator" (Hoegl and Gemuenden, 2001, p. 438). Therefore, when studying subjective ratings of team performance it is important to include the views of multiple sources (for example, of the customer, the team and the company) (Hoegl and Gemuenden 2001). Research has also shown that subjective ratings of performance do not represent the entire performance domain and that objective measures should be used, but also that this is only a significant problem if the performance ratings are given by the same source that rated other dependent and independent variables (D'Innocenzo et al., 2016).

For the purpose of this study, *efficiency* and *effectiveness* variables were used to describe team performance (Hoegl and Gemuenden, 2001). *Effectiveness* refers to the outcome quality and the degree to which expectations are met by the team. For projects such as those commonly found in IS, predefined properties of the process and services or products to be developed, such as reliability, functionality, performance and robustness, must be regularly adhered to in order to produce effective performance. Team *efficiency* refers to adherence to schedules, for example, starting the project on the target date and completing it on time and within budget. Thus, efficiency ratings are based on the comparison of the inputs, actual versus intended, whereas effectiveness reflects a comparison of the outcomes, actual versus intended (Hoegl and Gemuenden, 2001).

Work complexity has been found to have a negative correlation with team performance (Espinosa et al., 2007). This study investigated whether perceived work complexity is indeed negatively associated with team performance in this sample group. Hence:

Hypotheses H1-*h0* - Perceived work complexity does not have an effect on team performance.

Hypotheses H1-*h1* - Perceived work complexity has a negative effect on team performance.

2.3 Shared leadership

It is evident that the long-established definitions of what leadership entails are vague or inconsistent (Bass and Bass, 2009). In addition to the definition, the dynamics of who is a leader, as well as what is a leader in any given social context, are subjective and ambiguous. Furthermore, the proposition that members of a team somehow share leadership (shared leadership) complicates an already ambiguous scenario (D'Innocenzo et al., 2016).

The leadership literature can be viewed as being quite disjointed with a rapid increase of models and conceptualisations. The researchers listed below conceptualised and advanced ways of understanding different styles of leadership. For example:

- Shared Leadership (D'Innocenzo et al., 2016)
- Collective leadership (Friedrich, Vessey, Schuelke, Mumford, Yammarino, and Ruark, 2014)
- Complexity leadership (Uhl-Bien, Marion, and McKelvey, 2007)
- Distributed Leadership (Bolden, 2011)
- Team Leadership (Morgeson, DeRue, and Karam, 2010)

A recent meta-analysis by Tal and Gordon (2016) and Lord, Day, Zaccaro, Avolio, and Eagly (2017) showed that transformational, shared, complex and collective leadership theories are still important today. Though researchers have struggled with a clear definition of, and, more importantly, to articulate a theory of what shared leadership is, shared leadership ultimately stems from the "traditional leadership" theories (D'Innocenzo et al., 2016). Traditional theories state there is a "downward influence" between the leader and his/her followers, based on formal authority and power inherently possessed by the leader (Pearce, 2004). Leadership is multifaceted and there is more to it than a simple downward line towards subordinates. For example, reference is made to the "leader-member exchange", as discussed by Graen and Uhl-Bien (1995). Despite this, many authors, academics and researchers still perceive leadership in terms of theories based on hierarchy, individualisation and unilateral direction.

This research defines shared leadership as a "'serial emergence' of multiple leaders over the life of a team" (Pearce and Sims, 2002, p.176), and focuses on three types of leadership that members in a team might share – transformational, transactional, and directive (Pearce and Sims, 2002). Shared transformational leadership, for example, could be achieved through the inspiration of one another and a shared strategic vision, or by challenging existing norms and industry standards to create breakthrough services or products. Similarly, teams might engage in shared directive leadership. This type of leadership might be expressed as directive give-and-take testing of, for example, the engagement of key stakeholders, how to create or implement internal structures and systems, or how to develop strategic initiatives. Additionally, shared transactional leadership might be expressed by distributing rewards based on established key performance metrics, or through collegial recognition of contributions and efforts.

Leaders that understand complexity are able to shift complexity from the environment itself to the interactions between members, which reduces perceived work complexity. These leaders can predict and see through complexity, engage groups in dynamic organisational change, think through complex problems, and adaptively engage complex problem-solving with emotional intelligence of their own (Metcalf and Benn, 2012; Metcalf and Benn, 2013). When work is more interdependent, and knowledge-based, shared leadership promotes mutual learning and knowledge-sharing, which affects work complexity (Shah et al., 2015). Thus, the more shared leadership in teams, the less the perceived work complexity. Hence:

Hypotheses H2-*h0* - Shared leadership does not have an effect on perceived work complexity.

Hypotheses H2-*h1* - Shared leadership has a negative effect on perceived work complexity.

Scholarly research by Wang and colleagues indicates that leadership style has a relationship with work complexity and performance (Wang, Tsai et al., 2014) and that more complex work necessitates a higher degree of shared leadership (Wang, Waldman et al., 2014). In the absence of shared leadership, complex work is even more complex, leading to negative team performance.

Hypotheses H3-*h0* - Shared leadership does not have an effect on team performance.

Hypotheses H3-*h1* - Shared leadership has a positive effect on team performance.

3 Research hypotheses

The summary of the research of hypotheses is given below. The proposed hypotheses leads to a conceptual model of team performance, see Figure 3.1 below.

Hypotheses H1-*h0* - Perceived work complexity does not have an effect on team performance.

Hypotheses H1-*h1* - Perceived work complexity has a negative effect on team performance.

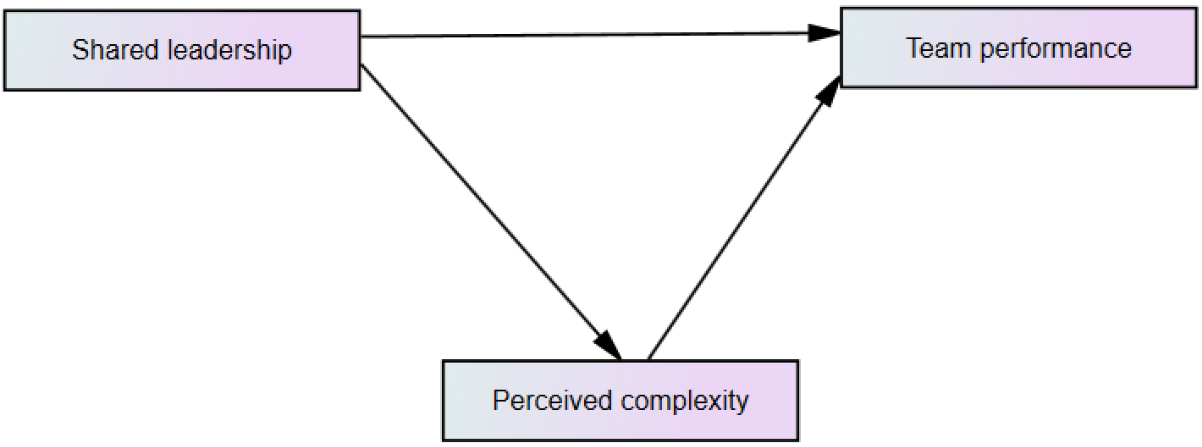
Hypotheses H2-*h0* - Shared leadership does not have an effect on perceived work complexity.

Hypotheses H2-*h1* - Shared leadership has a negative effect on perceived work complexity.

Hypotheses H3-*h0* - Shared leadership does not have an effect on team performance.

Hypotheses H3-*h1* - Shared leadership has a positive effect on team performance.

Figure 3.1 : Conceptual Model



4 Research methodology

This initial part of this section will discuss the research paradigm, and methodology. Then the unit of analysis, sampling method and size needed for hypothesis testing. Followed by the measurement instrument, which is a structured questionnaire. Then the data gathering process, and analysis approach, choices. The final part of this section discusses ethical considerations, and limitations.

4.1 Research Paradigm and Methodology

A realist paradigm informs this study (Saunders, and Lewis, 2012). This is because this study has drawn from existing theory on complexity, leadership, team performance, to create a predefined set of variables, based on formal propositions and relationships between the constructs. Also, the propositions and relationships will be tested using quantifiable measures of the variables. Finally, this proposed study doesn't contain any controllable conditions, i.e. the research strategy to answer the question is not through an experiment but rather a survey (Saunders, and Lewis, 2012).

A relational study/descriptive design will be followed with a survey methodology to carry out the study. A cross-sectional survey questionnaire will be used and hypotheses will be tested with quantitative methods.

4.2 Unit of Analysis and Sampling Method

The unit of analysis, population, will be IT employees which is defined as an employee with any of the following roles: MIS engineer, programmer, developer, information system professional, systems analyst, software architect, systems designer, data processing professional, and software engineer.

Survey methods are ideal when limited resources are available and allow for the collection of data from a larger sample. The survey method that will allow for this is a web-based questionnaire. A non-probability sampling approach will be used to maximized the reach of the population. Specifically, convenience and snowball sampling methods will be used to sample the population.

4.3 Measurement Instrument

The full measurement instrument can be seen in Appendix 2. Most of the research variables in this proposal uses existing scales to measure the constructs, which ensures greater content validity (DeVellis, 2016). Content validity is important to assesses if items measuring a construct are appropriate and valid (Bhattacherjee, 2012). To optimise reliability, a 7-point Likert scales will be used, which will allow for more variation in the data by preventing neural responses (DeVellis, 2016). For all variables to follow, the respondent will be asked to rate construct items ranging from:

1: Strongly Disagree 2: Disagree 3: Disagree Somewhat 4: Neither Agree nor Disagree 5: Agree Somewhat 6: Agree 7: Strongly Agree

4.3.1 Perceived Work Complexity

This proposal draws on Snowden and Boone (2007) postulation of complexity. Snowden and Boone (2007), proposed that complexity is more a “way of thinking about the world than a new way of working with mathematical models” (Snowden and Boone, 2007, p. 3). Because no existing scale could be found that measures **perceived** work complexity. A new scale based on Snowden and Boone (2007), is suggested (Appendix 1). The new perceived work complexity construct, is proposed to be measured in with 11 items:

- The project has a large number of interacting elements
- Implementing a minor change in the project can produce disproportionately major consequences
- The project is dynamic, the whole is greater than the sum of its parts
- Internal conditions related to the project changes constantly
- The internal elements in the project evolve with one another
- Internal environmental influences are difficult to reverse in the project
- External conditions related to the project changes constantly
- External conditions constrain the project
- The project has a history, and the past is integrated with the present
- The elements in the project evolve with the external environment
- External environmental influences are difficult to reverse in the project

4.3.2 Team Performance

The dependant variable of this proposal is team performance. Research have shown that subjective ratings of performance are not a representation of the entire performance domain and that objective measures should be used, but also the this is only a significant problem if the ratings of performance are given by the same source that rated other dependant and independent variables (D’Innocenzo et al., 2016). Because this research is working with perceptions of IT employees it was decided to continue on this thread and work with subjective ratings of *perceive* the team performance. This study will use subjective ratings to measure team performance, on the two dimensions of team performance, i.e. efficiency and effectiveness (Hoch and Kozlowski, 2014).

Effectiveness will be measured on 10 items retrieved from Hoch and Kozlowski (2014)

- Going by the results, this project can be regarded as successful
- All demands of the customers have been satisfied
- From the company's perspective, all project goals were achieved
- The performance of our team advanced our image to the customer
- The project result was of high quality
- The customer was satisfied with the quality of the project result
- The team was satisfied with the project result
- The product required little rework
- The product proved to be stable in operation
- The product proved to be robust in operation

Efficiency will be measured on 5 items retrieved from Hoch and Kozlowski (2014)

- From the company's perspective one could be satisfied with how the project progressed
- Overall, the project was done in a cost-efficient way
- Overall, the project was done in a time-efficient way
- The project was within schedule
- The project was within budget

4.3.3 Shared leadership

An existing scale was found to measure the shared leadership construct. Based on Pearce and Sims (2002), shared leadership can be measured using dimensions of transformational leadership.

The transformational leadership scale will be measured with twelve items, representing the behaviours of shared transformational leadership retrieved from Pearce and Sims (2002):

- My team members show enthusiasm for my efforts
- My team members approach a new project or task in an enthusiastic way
- My team members stress the importance of our team to the larger organisation
- My team members expect me to perform at my highest level
- My team members encourage me to go above and beyond what is normally expected of one (e.g., extra effort)
- My team members expect me to give 100% all of the time
- My team members provide a clear vision of where our team is going

- My team members provide a clear vision of who and what our team is
- Because of my team members, I have a clear vision of our team's purpose
- My team members aren't afraid to 'break the mold' to find different ways of doing things
- My team members are non-traditional types that "shakes up the system" when necessary
- My team members aren't afraid to "buck the system" if they think it is necessary

Directive shared leadership will be measured with a total of nine questions retrieved from Pearce and Sims (2002).

- My team members give me instructions about how to do my work
- My team members provide commands in regard to my work
- My team members establish my performance goals
- My team members set the goals for my performance
- My team members establish the goals for my work
- My team members let me know about it when I perform poorly
- My team members reprimand me when my performance is not up to par
- When my work is not up to par, my team members points (point it out to me

Transactional shared leadership will be measured with a total of six questions retrieved from Pearce and Sims (2002).

- My team members give me positive feedback when I perform well
- My team members commend me when I do a better-than-average job
- My team members give me special recognition when my work performance is especially good
- My team members will recommend that I am compensated well if I perform well
- My team members will recommend that I am compensated more if I perform well
- If I perform well, my team members will recommend more compensation

4.3.4 Controls

Education will be measured on a numerical scale ranging from 1 (Less than high school) to 9 (PhD) and gender on a scale (0 = male; 1 = female; 3 = Prefer not to say). Organisational hierarchy will be used to measure the job level of the respondent's position (1 = One level below the CEO; 2 = Two levels below the CEO; 3 = Three levels below the CEO; 4 = Four or more levels below the CEO). Organisational tenure will measured as an ordinal categorical variable (1 = Between 0 – 3 years, 2 = Between 3 –

5 years, 3 = Between 5 – 10 years, 4 = 10 years or more). Age will be measured as an ordinal categorically variable (1 = Below 20 years, 2 = Between 20 - 30 years, 3 = Between 30 - 40 years, 4 = Between 40 - 50 years, 5 = Between 50 - 60 years, 6 = Above 60 years). Lastly working at different locations will be measured on a numerical scale ranging from 0 (0% of my total time) to 10 (100% of my total time). The control measurements are summarised in Appendix 2.

4.4 Data Gathering Process

The data gathering process will be done in two three phases. The first phase will be done to ensure face validity which is important to ensure that items are meaningful and reasonable to measure the underlying constructs (Bhattacherjee, 2012). This study will draw on the expertise of academic experts to ensure face validly. The second phase will employ a pilot test which will be carried out within a preselected division within an organisation. The questionnaire will be sent to the selected division and respondents will be asked to comment on the clarity and their understanding of instructions provided. Statistical tests will also be executed on the collected data from the pilot test, to further ensure the distribution and reliability of existing and new scales. The final phase will use a non-probability sampling approach with convenience and snowball sampling methods to sample the population.

4.5 Analysis Approach

There is an increasing popularity of using SEM in social sciences in general and in IS research in particular is due to the comprehensiveness of this technique, as it combines benefits of multiple regression, factor analysis, path analysis, analysis of covariance, and time series analysis. Considered as a second generation of multivariate statistical analysis techniques (Fornell and Larcker, 1987), SEM has significant advantages over the first-generation techniques by providing possibilities to: model relationships between criterion and multiple predictor variables; model such concepts as unobservable (latent) variables; statistically test structural and measurement models against empirical data; model observable variables with errors in the measurement; test overall models rather than individual coefficients, model error terms; test models with multiple dependent variables; handle multiple between-subject groups; handle erroneous, non- normal or incomplete data; model mediating variables; better approach model misspecification (Chin, 1998).

This study followed well-known recommendation for performing SEM analysis as a two-step process (Anderson and Gerbing, 1988). Firstly, it will formulate and test the measurement model; if it fits the data (validity is confirmed), then secondly, this research will proceed with analysis of the corresponding structural model. SEM techniques can be classified into two main types: covariance-based SEM (CB-SEM) and component-based SEM (usually referred to as PLS-SEM, PLS is an abbreviation from partial least squares). Within the CB-SEM group, linear structural relations (LISREL) method represents the most widely used method. These two approaches are considered complementary and depend on the purpose of research and the nature of indicators. CB-SEM is considered as more suitable for confirmatory research, while PLS – for exploratory research (Anderson and Gerbing, 1988). Considering advantages and disadvantages of both CBSEM and PLS-SEM across important criteria, such as, primarily, suitability for confirmatory research, as well as ability to ensure model convergence, ability to analyse formative latent variables, sample size requirements flexibility, tolerance for non-normal data distribution, tolerance for archival data, and statistical power of a SEM method (Gefen, Rigdon, and Straub, 2011; Hair, Ringle, and Sarstedt, 2011; Ringle, Sarstedt and Straub, 2012). Because this study is based solid theoretical base and all constructs have minimum of 3 items, the presented study is considered confirmatory and CBSEM is appropriate.

SEM methodology distinguishes two types of models with latent constructs: structural model and measurement model. In the context of a structural model, SEM uses the term exogenous to describe independent variables and the term endogenous to describe dependent variables, independent variables are latent constructs that do not have relationships pointing at them in the structural model, dependent variables are latent constructs that are “explained” by other constructs in a structural model (Hair et al., 2011). While the structural model displays the relationships (causal paths) between latent constructs, the measurement model displays “unidirectional predictive relationships between each latent construct and their associated observed indicators” (Hair et al., 2011, p. 141). In other words, structural model is concerned about relationship between constructs, while measurement model – about relationship between constructs and their measures (Freeze and Raschke, 2007).

Based on the causal structure of latent variables in a measurement model, SEM recognizes two types of measurement models: reflective and formative. In the reflective model, a latent variable is considered as the cause of an item or indicator, and not vice versa. In contrast, in the formative model, a latent variable (construct) is considered as a composition formed from independent, but correlated, variables (hence the term formative). These independent variables are in essence the indicators of the formative construct (Jarvis, Mackenzie and Podsakoff, 2003). Based on the analysis of best practices of SEM use in research literature, this research study will use a number of validation heuristics, which will be discussed next (Dawson, 2014).

Construct validity will be measured first through exploratory factor analysis (EFA). Adopting the methodology from Hair, Wolfinbarger Celsi, Money, Samouel, and Page (2015), exploratory factor analysis will be conducted for the constructs of perceived work complexity, shared leadership, and team performance to test validity. The exploratory factor analysis will demonstrate convergent validity if item loadings are above 0.6 and discriminant validity if cross-loadings are below 0.3. The AVE will demonstrate convergent validity if the variance of each construct is above 0.5, and discriminant validity if the shared variance between the constructs are larger than the average variance (Hair et al., 2015). Discriminant and convergent validity statistical methods has been proven to be appropriate to show the direct (convergent) effect of an item on the construct and proving that the item is unrelated (discriminant) to other constructs (Kang, Zhang, Cai, and Small, 2016). Furthermore, validity can be proven measuring the Cronbach's alpha of a given construct, Cronbach's alphas above 0.70 has been shown to be an acceptable indicator of construct reliability (Bartling, Fehr, and Herz, 2014; Gliem and Gliem, 2003).

Normality will be tested using Skewness and Kurtosis as SEM makes the assumption that data is normally distributed. perceived work complexity, shared leadership and team performance was built on linear relationships and it was also based on the dependent variable data being normally distributed. Therefore, normality test of the data, using Skewness and Kurtosis, will be conducted so as to confirm that the data is normally distributed. To prove normal univariate distribution, the value for kurtosis and skewness between -2 and +2 are considered acceptable (George and Mallery, 2010).

After the number of factors are determined a confirmatory factor analysis (CFA) will be performed to validate the uncovered model of the EFA. CFA is a SEM modelling method for testing relationships among latent factors and measures (Harlow, 2014). As proposed by Hu and Bentler (1999), the CFA measurement model is valid if the model fits the data well, good fitting models should have a root mean square error of approximation (RMSEA) of less or equal to than .06 and a comparative fit index (CFI) of .95 or greater. Additionally, if each indicator's VIF value is less than 5, the average variance extracted (AVE) is above 0.5, and composite reliability (CR) is above 0.7 for all constructs validity and reliability will be satisfactory (Gefen, Straub, and Boudreau, 2000; Hair et al., 2011). After proving the validity of the constructs, composite variables will be created from the latent factors in the measurement model. After proving the validity of the constructs, composite variables will be created for the individual constructs. The composite variables of perceived work complexity, team performance, and shared leadership will be calculated using the equal weighted mean of relevant variables measuring the constructs.

Mediation will be assessed through the bootstrapping technique and will allow for bias-estimated, two-sided confidence intervals that will allow to estimate the mediation effects of constructs. Significance levels of indirect effects in the model will be estimated using bootstrapping, bootstrapping involves estimating the indirect effects by using a computationally intensive method and repeatedly resampling the data set (Preacher and Hayes, 2008). According to Gunzler, Chen, Wu, and Zhang, (2013) 'the indirect effect describes the pathway from the exogenous variable to the outcome through the mediator'. The bootstrap-estimated indirect effects will be assessed for statistical significance and if they include zeros (Preacher and Hayes, 2008), for all indirect effects, 95% bootstrap confidence intervals and 2000 resamples will be used as suggested by Cheung and Lau (2008). The Sobel test, which is a z-test of an unstandardized indirect effect will be used to compute whether s mediating variable significantly carries the influence of an independent variable on a dependent variable (Zhao, Lynch Jr, and Chen, 2010).

Moderation will be assess using the two-way interactions approach. Which will require the creation of an interaction variable so if X and Z are the independent and moderator variable, then the term XZ is calculated by multiplying X and Z together which is the interaction term. An important decision to make is whether to use the variables X and Z in their raw form, or to mean enter (or z-standardize) them before starting the process. In the vast majority of cases, this makes no difference to the detection of moderator effects; however, each method confers certain advantages in the interpretation of results and it is recommend that these variables are either mean-centered or z-standardized before the computation of the interaction term (Dawson, 2014). This research will create an interaction variable based on the z- standardized scores. To test whether moderation is significant, the coefficient of the interaction variable needs to significant.

4.7 Piloting

This study employed a pilot test which was carried out within a preselected division within an organisation. The questionnaire was sent to the selected division and respondents was asked to comment on the clarity and their understanding of instructions provided. The questionnaire was administered to a convenient sample of 16 IT employees to comment on the clarity of instructions provided and their understanding of the questionnaire. Statistical tests were also executed on the collected data from the pilot test, to further ensure the distribution and reliability of existing and new scales. Because some respondents were working on projects that have not been completed some minor changes were made to the project performance scale of Hoch and Kozlowski (2014), e.g. “this project can” was adapted to “this project can be or will”; “result was” was adapted to “result was or will be” , which is shown in Table 4.1 and 4.2 below.

Table 4.1 - Team Performance - Effectiveness (TPEF)

	Original item	**Adapted item**
TPEF1	Going by the results, this project can be regarded as successful	Going by the results, this project can be or will be regarded as successful
TPEF2	All demands of the customers have been satisfied	All demands of the customers have been or will be satisfied
TPEF3	From the company’s perspective, all project goals were achieved	From the company’s perspective, all project goals were or will be achieved
TPEF4	The performance of our team advanced our image to the customer	The performance of our team advanced or advances our image to the customer
TPEF5	The project result was of high quality	The project result was or will be of high quality
TPEF6	The customer was satisfied with the quality of the project result	The customer was or will be satisfied with the quality of the project result
TPEF7	The team was satisfied with the project result	The team was or will be satisfied with the project result
TPEF8	The product required little rework	The project result required or will require little rework
TPEF9	The product proved to be stable in operation	The project result proved or will prove to be stable in operation
TPEF10	The product proved to be robust in operation	The project result proved or will prove to be robust in operation

Table 4.2 - Team Performance - Efficiency (TPEC)

	Original item	**Adapted item**
TPEC1	From the company's perspective one could be satisfied with how the project progressed	From the company's perspective one could be or will be satisfied with how the project progressed
TPEC2	Overall, the project was done in a cost-efficient way	Overall, the project was done or has been done in a cost-efficient way
TPEC3	Overall, the project was done in a time-efficient way	Overall, the project was done or has been done in a time-efficient way
TPEC4	The project was within schedule	The project was or is within schedule
TPEC5	The project was within budget	The project was or is within budget

4.8 Ethical Considerations and Limitations

Ethical considerations need to be taken into account prior to data collection. The data collection protocol will ensure that responses are collected ethically, and that participation in the study is voluntary, allowing participants to withdraw from the study at any time, and ensuring anonymity (Saunders and Lewis, 2012). Respondents who are invited to complete the questionnaire will not be asked to provide any personal information, see Appendix 4 - Informed consent letter. Additionally, individual responses will not be reported and only aggregated results will be discussed. Moreover, data collected from respondents will not be shared with any third parties. Finally, the results will only be reported in the research report or published journals.

This study acknowledges the following limitations:

- Generalisability: Not having a complete list of the population, this study cannot select the sample randomly and will use a non-probability sampling technique as a means to collect data. This minimises external validity as generalisability will be difficult to prove using a non-probability sampling technique. Due to time and funding constraints there was no alternative (Bhattacherjee, 2012; Saunders, and Lewis, 2012).
- Common-method bias is a limitation as a single respondent will provide data about the independent and dependent variables (Bhattacherjee, 2012).
- Non-response bias: Respondents will be invited to partake in this study which means that responding to the survey might not appeal to some IT employees, and not receiving all respondent's inputs could bias the results and affect the generalisability (Bhattacherjee, 2012).
- Internal causality/validity: The study uses a cross-sectional design, because the data will be collected in one period in time from participants, and therefore establishing the temporal precedence of whether perceived work complexity actually impacts team performance cannot be truly established (Saunders, and Lewis, 2012).
- Because of the difficulty for controlling all confounding variables, additional internal validity threats could arise, the problem of using correlation evidence and potential for reciprocal causality cannot be proven. Because the current research uses existing proven theory this effect will be alleviated (Hair et al., 2015).
- This proposal focuses on perceived complexity and not actual work complexity. Thus, no inferences can be made about the actual complexity of the system to which the respondent was exposed.

5 Results

5.1 Introduction

The instrument, approach and research methodology for data collection were discussed in chapter 4. In this chapter the data analysis and results are presented. This chapter shows the preparation of the data, including outlier and missing value detection. Followed by the respondent profiles and presenting the exploratory and confirmatory factor analysis to presented reliability and validity of the results. This chapter concludes with the results of hypothesis testing using structural equation modelling.

5.2 Data screening, missing value and outliers

The data collection strategy as described in the previous chapter was followed and 217 respondents were obtained from the distributed questionnaire. An initial scan of the responses showed 7 responses had a job role that didn't meet this research's definition of an "IT employee" and where eliminated.

5.2.1 Missing values

5.2.1.1 Cases with missing data

The results showed that 47 (22.4%) of the responses had missing item data, one case was missing three responses, 4 (2%) cases had two missing items and 34 (16.2%) had one missing item. Hair, Black, Babin, and Anderson (2010) suggested as a rule of thumb that cases are candidates for deletion if the case is missing more than 15% of the data and cases may be retained if they are only missing 10% of required data. Five cases were thus deleted because the response was missing more than 15% of the data and will be excluded from further analysis. Please see Appendix 5 – Table 5.1.

5.2.1.2 Questionnaire items with missing data

One respondent did not wish to provide tenure, five did not provide job level details, and nine did not provide education (Appendix 5 - Table 5.2). Appendix 5 - Table 5.2 shows missing data on the questionnaire items. No items were eliminated because no questionnaire items were over the cut of criteria of missing more than 5% of the data. The series mean was used to replace all ordinal missing items of said item, except in the case of tenure, job level and education were replaced with the series mode.

5.2.1.3 Outliers

Outliers were identified as responses with distinctly different characteristics identifiable from other observations (Hair et al., 2010). Univariate outlier detection was used to examine if the distribution of cases where at the outer ranges of the sample. This research had a sample sizes of over 200 responses and thus a standardised score of 4.0 was used as the threshold (Hair et al., 2010).

One case was excluded in further analysis as the respondent's, for a number of their responses, had standard scores above 4. Therefore, the final sample used was 204 cases.

5.3 Respondent Profile

The profile of the 204 useable respondents on education, gender, job level, age, IT role, and tenure are presented next as demographics.

Education

39.2% of the respondents had a bachelor's degree and 16.2% had some college (Table 5.4).

Table 5.4 - Education

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	High school	13	6.4	6.4	6.4
	Some college	33	16.2	16.2	22.5
	Technical degree	24	11.8	11.8	34.3
	Some graduate courses'	22	10.8	10.8	45.1
	Bachelor's degree	80	39.2	39.2	84.3
	Master's degree	27	13.2	13.2	97.5
	Post-master's courses	2	1.0	1.0	98.5
	Doctoral degree	3	1.5	1.5	100.0
	Total	204	100.0	100.0	

Gender

80.9% of the respondents were male (Table 5.5). Given that information technology has been stereotyped as male dominated profession this is not surprising.

Table 5.5 - Gender

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	165	80.9	80.9	80.9
	Female	37	18.1	18.1	99.0
	Prefer not to say	2	1.0	1.0	100.0
	Total	204	100.0	100.0	

Age

48% of employees were between the ages of 20 and 30 years, while IT employees in the age categories of 30 to 40 and 40 to 50 constituted 39.7% and 9.3% of total respondents respectively. Only 2.9% of employees were above the age of 50 (Table 5.6).

Table 5.6 - Age

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	between 20 - 30 years	98	48.0	48.0	48.0
	between 30 - 40 years	81	39.7	39.7	87.7
	between 40 - 50 years	19	9.3	9.3	97.1
	between 50 - 60 years	6	2.9	2.9	100.0
	Total	204	100.0	100.0	

Tenure

Approximately 57.4% of respondents had between 0 and 3 years working experience at their respective organisations, with 21.6% of the employees working for a period ranging between 3 to 5 years, and only 6.9% for more than 10 years (Table 5.7).

Table 5.7 - Tenure

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	between 0 – 3 years	117	57.4	57.4	57.4
	between 3 – 5 years	44	21.6	21.6	78.9
	between 5 – 10 years	29	14.2	14.2	93.1
	10 years or more	14	6.9	6.9	100.0
	Total	204	100.0	100.0	

Job Level

Approximately 62.3% of respondents were four or more levels below the CEO at their respective organisations, with 18.6% of the employees were three level below the CEO, and only 8.8% one level below the CEO (Table 5.8).

Table 5.8 - Level

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Four or more levels below the CEO	127	62.3	62.3	62.3
	Three levels below the CEO	38	18.6	18.6	80.9
	Two levels below the CEO	21	10.3	10.3	91.2
	One level below the CEO	18	8.8	8.8	100.0
	Total	204	100.0	100.0	

Role

Most IT employees thought as themselves as a software developer or MIS engineer (Table 5.9).

Table 5.9 - Role

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Business intelligence analyst	25	12.3	12.3	12.3
	Manager	14	6.9	6.9	19.1
	MIS engineer	52	25.5	25.5	44.6
	Software architect	9	4.4	4.4	49.0
	Software Developer	86	42.2	42.2	91.2
	Systems designer	2	1.0	1.0	92.2
	Technician	4	2.0	2.0	94.1
	Test Analyst	12	5.9	5.9	100.0
	Total	204	100.0	100.0	

Work on site

Most IT employees either worked 100% on site or 0% on site accounting for 34.3% and 31.9% respectively of the sample, see Table 5.10 below.

Table 5.10 – Work On Site

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	.0	65	31.9	31.9	31.9
	1.0	12	5.9	5.9	37.7
	2.0	7	3.4	3.4	41.2
	3.0	7	3.4	3.4	44.6
	4.0	6	2.9	2.9	47.5
	5.0	4	2.0	2.0	49.5
	6.0	4	2.0	2.0	51.5
	7.0	7	3.4	3.4	54.9
	8.0	4	2.0	2.0	56.9
	9.0	18	8.8	8.8	65.7
	10.0	70	34.3	34.3	100.0
	Total	204	100.0	100.0	

5.4 Validity and Reliability

5.4.1 Exploratory factor analysis

Initially a factor analysis was conducted using maximum likelihood estimation, as the means of extraction and Promax as the method of oblimin rotation. This method was used to estimate parameters for the SEM model. Factor analysis was used as a tool for analysing correlations among factors that were highly correlated (factors) (Hair et al., 2015), while oblimin rotation was used to estimate parameters to facilitate SEM model generation.

The first factor analysis was run on the items measuring the variables of transformational shared leadership (SLTF), transactional shared leadership (SLTX), directive shared leadership (SLDR), perceived work complexity (TC), team performance effectiveness (TPEF), and team performance efficiency (TPEC). The factor analysis found that PC1, PC3, PC5, PC7, PC8, PC9, PC10, SLTF4, SLTF6, SLTF11, SLTF12, SLDR1, SLDR2, SLDR3, SLDR4, SLDR5, SLDR6, SLTX4, SLTX5, SLTX6, TPEC4, TPEF8, TPEF9, TPEF10 were subsequently removed because the items loaded with factors they were not intended to measure. The KMO and Barlett's test (Table 5.11) shows the use of factor rotations was appropriate and the items were factorable. All non-significant loadings for the factor analyses of less than 0.3 were suppressed (Table 5.12).

The following perceived work complexity items where kept:

- Implementing a minor change in the project can produce disproportionately major consequences
- Internal conditions related to the project changes constantly
- Internal environmental influences are difficult to reverse in the project
- External environmental influences are difficult to reverse in the project

The following perceived work complexity items where dropped:

- The project has a large number of interacting elements
- The project is dynamic, the whole is greater than the sum of its parts
- The internal elements in the project evolve with one another
- External conditions related to the project changes constantly
- External conditions constrain the project
- The project has a history, and the past is integrated with the present
- The elements in the project evolve with the external environment

Table 5.11 - KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.893
Bartlett's Test of Sphericity	Approx. Chi-Square	3 200.057
	df	276
	Sig.	0.000

Table 5.12 - Pattern Matrix[a]

	Factor					
	Team effectiveness	Transformational shared leadership	Team efficiency	Directive shared leadership	Perceived complexity	Transactional shared leadership
PC2					0.715	
PC4					0.616	
PC6					0.817	
PC11					0.727	
SLTF2		0.670				
SLTF5		0.657				
SLTF7		0.919				
SLTF9		0.871				
SLTF10		0.666				
SLDR7				0.795		
SLDR8				0.853		
SLDR9				0.836		
SLTX1						0.805
SLTX2						0.914
SLTX3						0.796
TPEF1	0.824					
TPEF2	0.935					
TPEF3	0.900					
TPEF5	0.821					
TPEF7	0.572					
TPEC1			0.453			
TPEC2			0.971			
TPEC3			0.730			
TPEC5			0.695			

Extraction Method: Maximum Likelihood. Rotation Method: Promax with Kaiser Normalization.
a. Rotation converged in 7 iterations.

5.4.3 Normality test

The results in the Table 5.13 on skewness indicate statistics ranging from (-1.309 to -0.138) which are within the recommended range of (-2 to +2) implying that the study variables are fairly normally distributed. Kurtosis values range from (-0.977to 1.704) which are within the range of (-2 to +2) Implying fairly normal distribution of the study variables. According to George and Mallery (2010), when the skewness statistics are ranging within (-2 to +2), the variables are said to be in normal distribution.

Table 5.13 - Assessment of normality

Variable	skew	kurtosis
PC11	-0.39	-0.721
PC6	-0.138	-0.922
PC4	-0.377	-0.92
PC2	-0.443	-0.977
TPEC5	-0.507	-0.156
TPEC3	-0.664	-0.466
TPEC2	-0.78	0.397
TPEC1	-1.269	1.704
SLTX3	-0.693	-0.285
SLTX2	-0.913	0.046
SLTX1	-0.95	0.202
SLDR9	-0.546	-0.673
SLDR8	-0.211	-1.05
SLDR7	-0.532	-0.712
SLTF10	-0.904	0.113
SLTF9	-0.813	-0.168
SLTF7	-0.728	-0.172
SLTF5	-0.923	0.244
SLTF2	-1.076	0.957
TPEF7	-0.934	0.959
TPEF5	-1.309	1.642
TPEF3	-1.18	0.926
TPEF2	-1.044	0.884
TPEF1	-1.286	1.457
Multivariate		158.216

5.4.3 Confirmatory factor analysis (CFA)

The researcher conducted separate confirmatory factor analysis on the combined sample (N = 204) using AMOS 24.0 maximum likelihood procedure. As Hu and Bentler

(1999) proposed, good fitting models should have a root mean square error of approximation (RMSEA) of less or equal to than .06 and a comparative fit index (CFI) of .95 or greater.

5.4.3.1 Measurement model

Using 204, the researcher compared the fit of two different factor structures. The first was a four first-order factor model of transformational shared leadership, transactional shared leadership, directive shared leadership, perceived work complexity (PC), team performance efficiency, and team performance effectiveness. The second was a second-order factor model in which items of team performance efficiency and effectiveness were loaded onto their respective factors and the two factors loading on a second-order latent team performance (TP) factor. Then items of shared leadership (SL), i.e. transformational, transactional, directive, loaded onto their respective factors and the three factors loading on a second-order latent shared leadership factor. The fit statistics for the two models are shown in Table 5.14. The two models (first-order and second-order) are mathematically equivalent (Bollen, 1989). However, because a second-order factor model accounts for corrected errors amongst the covariation of first-order factors which is very common in first-order CFA, if justifiable, the second-order latent factor model is preferable (Gerbing and Anderson, 1984).

Table 5.14 - Fit indexes

Structure	χ2	df	χ2/df	CFI	RMSEA	PCLOSE
First-order factor model	372.748	237	1.573	0.956	0.053	0.301
Second-order factor model	393.213	244	1.612	0.951	0.055	0.206

The six-factor first-order factor model of transformational shared leadership, transactional shared leadership, directive shared leadership, perceived work complexity, team performance efficiency, and team performance effectiveness, was entered into a SEM measurement model, see Figure 5.1 below. The fit statistics are as follows: $\chi 2$ = 372.748, df =237, $\chi 2$/df = 1.573, CFI = 0.956, and RMSEA = 0.053, and PCLOSE = 0.301. All factor loadings are significant at $p<0.001$. The second order factor, Figure 5.2 below, model fit statistics are as follows: $\chi 2$ = 393.213, df =244, $\chi 2$/df = 1.612, CFI = 0.951, and RMSEA = .055, and PCLOSE = 0.206. It was decided to use the second order to create the composite variables.

Figure 5.1 – First order measurement model

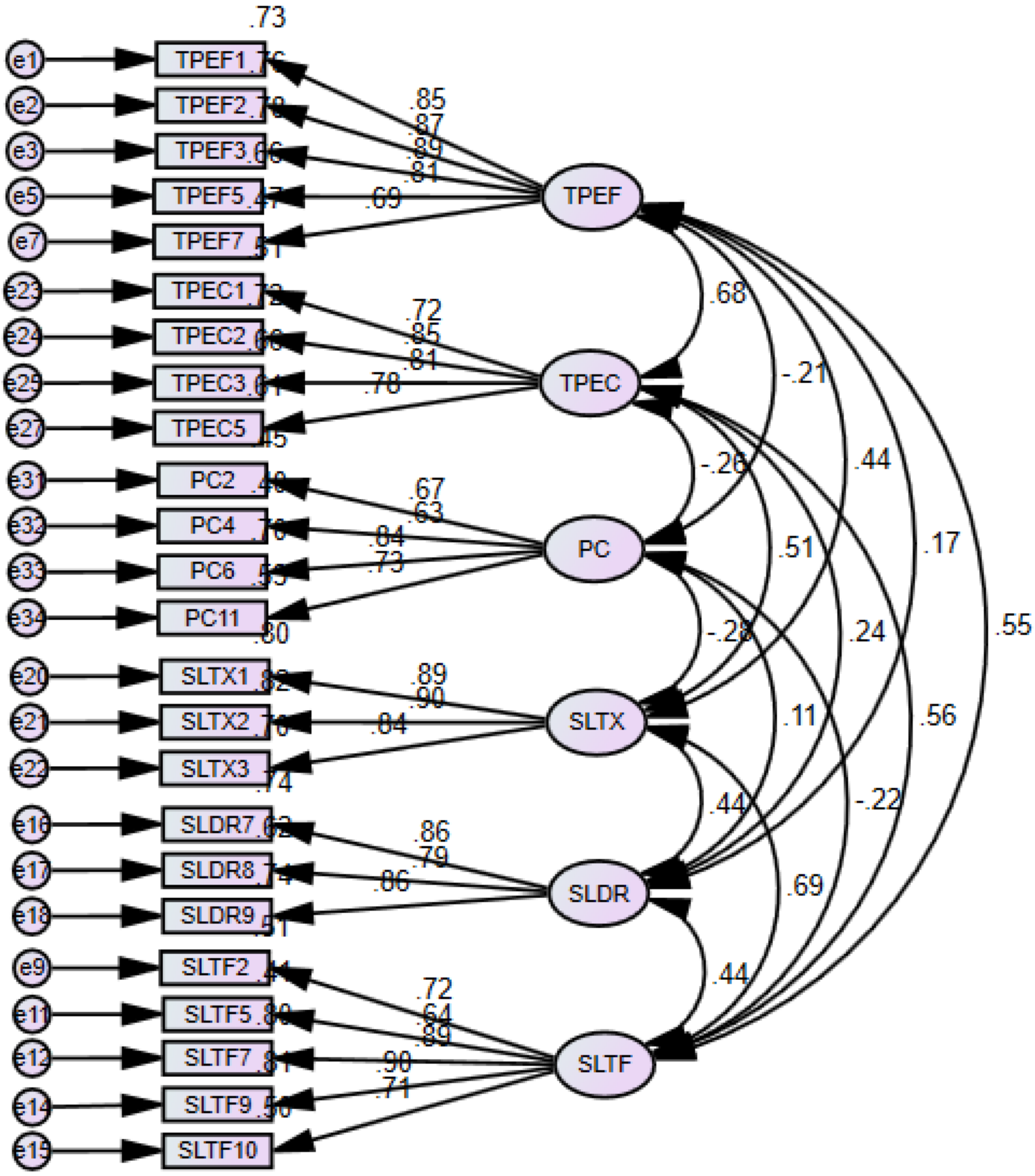
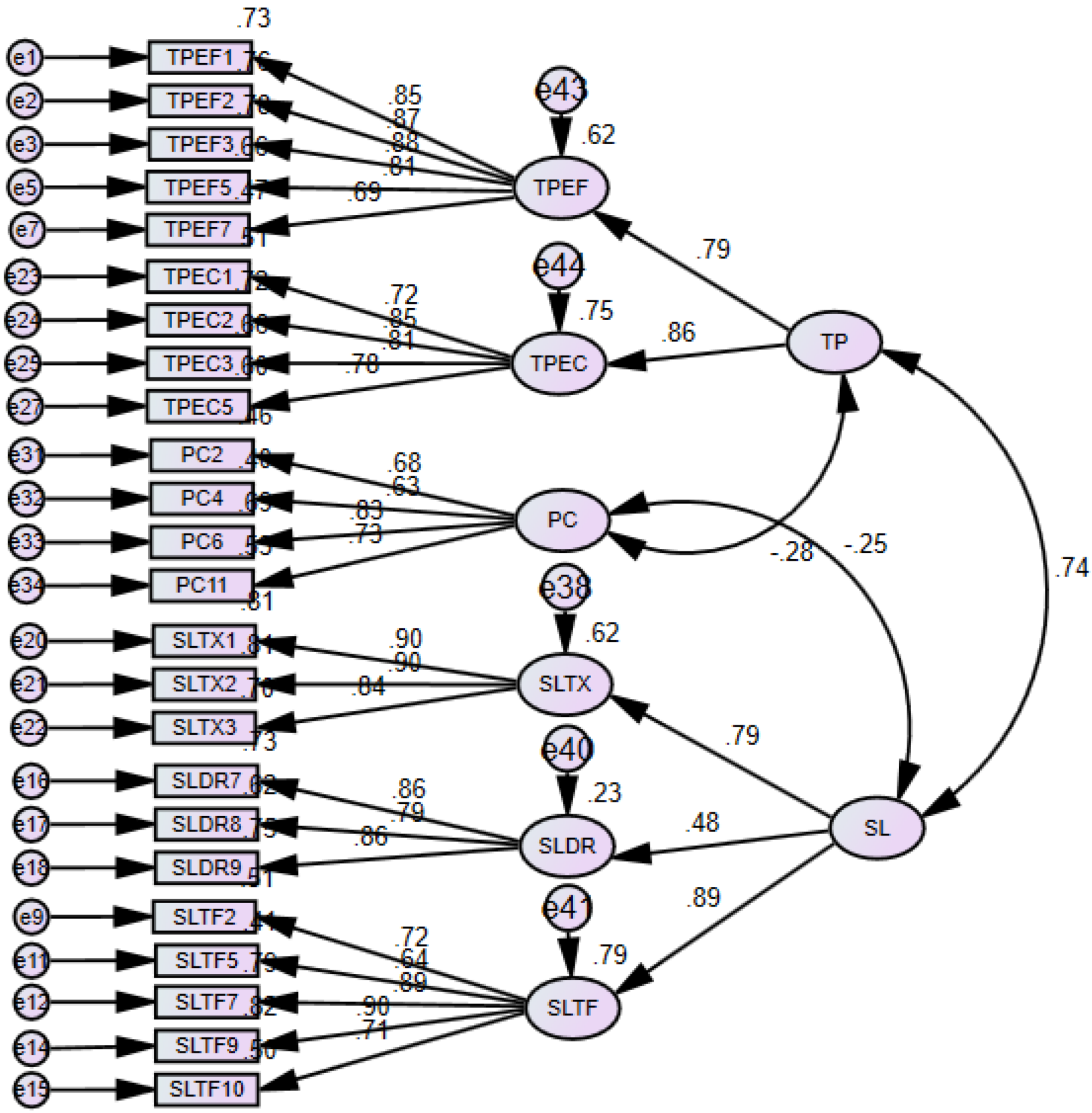


Figure 5.2 – Second order measurement model



The scores of the standardized factor loadings, presented in Table 5.15 below, of the first order factor model, loadings of the factors are ranging from .632 to .903.

Table 5.15 - Standardized factor loadings

	Factor					
	Team effectiveness	Transformational shared leadership	Team efficiency	Directive shared leadership	Perceived complexity	Transactional shared leadership
PC2					.680	
PC4					.632	
PC6					.833	
PC11					.727	
SLTF2		.716				
SLTF5		.640				
SLTF7		.890				
SLTF9		.903				
SLTF10		.707				
SLDR7				.856		
SLDR8				.788		
SLDR9				.864		
SLTX1						.900
SLTX2						.899
SLTX3						.836
TPEF1	.854					
TPEF2	.872					
TPEF3	.885					
TPEF5	.812					
TPEF7	.687					
TPEC1			.717			
TPEC2			.851			
TPEC3			.814			
TPEC5			.777			

Additionally, the average variance extracted (AVE) was above 0.5, composite reliability (CR) was above 0.7 for all constructs. Also, the MSV was greater than the AVE for all constructs adding additional support for discriminate validity (Hair et al., 2010, 2014). The Curve estimation and a multicollinearity test was also checked. All VIF loadings were below 3 and all estimations was linear (Grewal, Cote, and Baumgartner, 2004). For each of the measures the internal consistency alphas (Cronbach's alpha) was also above 0.7, please see table 5.16 below.

Table 5.16 - Construct Validity

	Cronbach's Alpha	CR	AVE	MSV	**PC**	**SLTF**	**TP**
Perceived work Complexity	0.805	0.773	0.546	0.543	0.739		
Shared leadership	0.907	0.812	0.521	0.080	-0.249	0.722	
Team performance	0.913	0.810	0.680	0.543	0.737	-0.283	0.825

5.6 ANOVA

A one-way ANOVA was used to check if categorical nominal variables of role and gender differ across perceive work complexity, shared leadership and team performance. Additionally, all other ordinal control variables were also checked for differences including working on site, age, education and tenure see, Appendix 6 for detailed analysis.

Only age and working on site was significant between the dependent and independent variables. Work on site was coded into not working at different locations (0) and working at different locations (1). The results suggested that IT employees in that work at different locations were reporting significantly different ratings in perceived work complexity ($p < 0.05$). Also, the respondent's age was statistically significantly different ($p < 0.05$) when reporting shared leadership. Because of this differences across the independent and dependent variables, it was necessary to add a control for this effect of working on site and age in the analyses reported next.

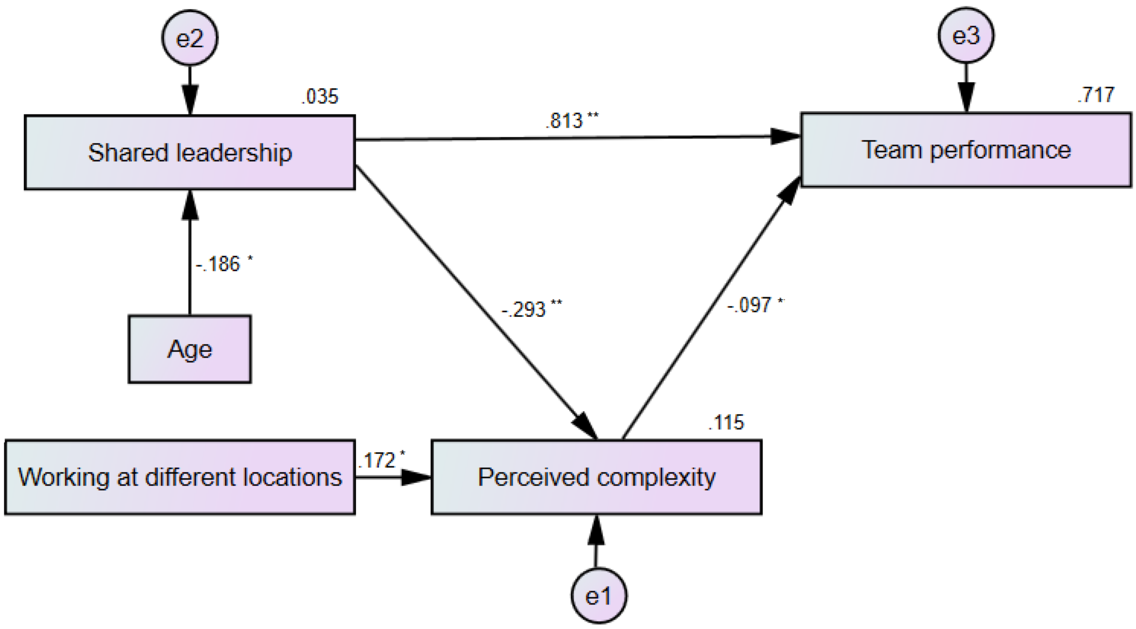
5.7 Hypotheses testing

Structural equation modelling analysis was carried to test the hypotheses identified in Chapter 3. Results are reported next.

5.7.1 Structural model

The structural model was constructed to evaluate shared leadership, perceived work complexity, team performance, and additionally control variables of age, and working at different locations, were added. In the structural model below shared leadership is a latent factor of transformational shared leadership, transactional shared leadership, directive shared leadership, and team performance is a latent factor of team performance efficiency, and team performance effectiveness. The model fits the data perfectly with fit statistics at: $\chi 2$ = .852, df = 5, $\chi 2$/df = .170, RMSEA = .000, PCLOSE = 0.991, GFI = 1 (See Figure 5.3 below).

Figure 5.3 - Structural model



Note: ** p < 0.001, * p < 0.05

Regression weights for all paths were significant (all p < .05) in the model. Table 5.17 below, shows the regression weights results. The results confirm perceived work complexity negatively predicts team performance (β = -0.097, p<0.05), supporting H1. Shared leadership negatively predicts perceived work complexity (β = -0.293, p<0.001), supporting H2. But also, shared leadership positively predicts team performance (β = 0.813, p<0.001) confirming Hypotheses H3. Thus, the predicted direct effects of shared leadership on perceived work complexity received empirical support.

Table 5.17 - Regression weights

Relationship			Estimate	S.E.	C.R.	P
SL	<---	Age	-.186	.091	-2.704	.007*
PC	<---	Work On Site	.172	.164	2.604	.009*
PC	<---	SL	-.293	.076	-4.432	**
TP	<---	PC	-.097	.026	-2.492	.013*
TP	<---	SL	.813	.030	20.843	**

Note: ** p-value significant at smaller than .001 significance level or 99% confidence interval, * p-value at smaller than .05 significance level or 95% confidence interval

Together perceived work complexity and shared leadership, are strong predictors of team performance as they explained 71.7% of the variance in team performance, see Table 5.18 below.

Table 5.18 – Squared multiple correlations

	Estimate
SL	.035
PC	.115
TP	.717

Since shared leadership impacted the hypothesized perceived work complexity (β = -.293, p < .001), which in turn had significant effects on the outcome variable, i.e., team performance (β = -.097, p < .05), suggesting that mediation could exists which will be discussed next.

5.7.1.2 Mediation

In order to determine whether the indirect effect is significant, the researcher made use of the Bootstrap samples (as they don't assume normal distribution of the sample) to determine the standard error of the indirect effect (Preacher and Hayes, 2008). AMOS 24.0 bias-corrected percentile bootstrap method (β = 2000 samples) was employed.

Table 5.19 - Regression weights

Relationship	Total effect	Direct effect	Indirect effect
Team performance			
Shared leadership **	0.842 (0.001)	0.813 (0.001)	0.028(0.002)
Perceived work complexity *	-0.097 (0.003)		

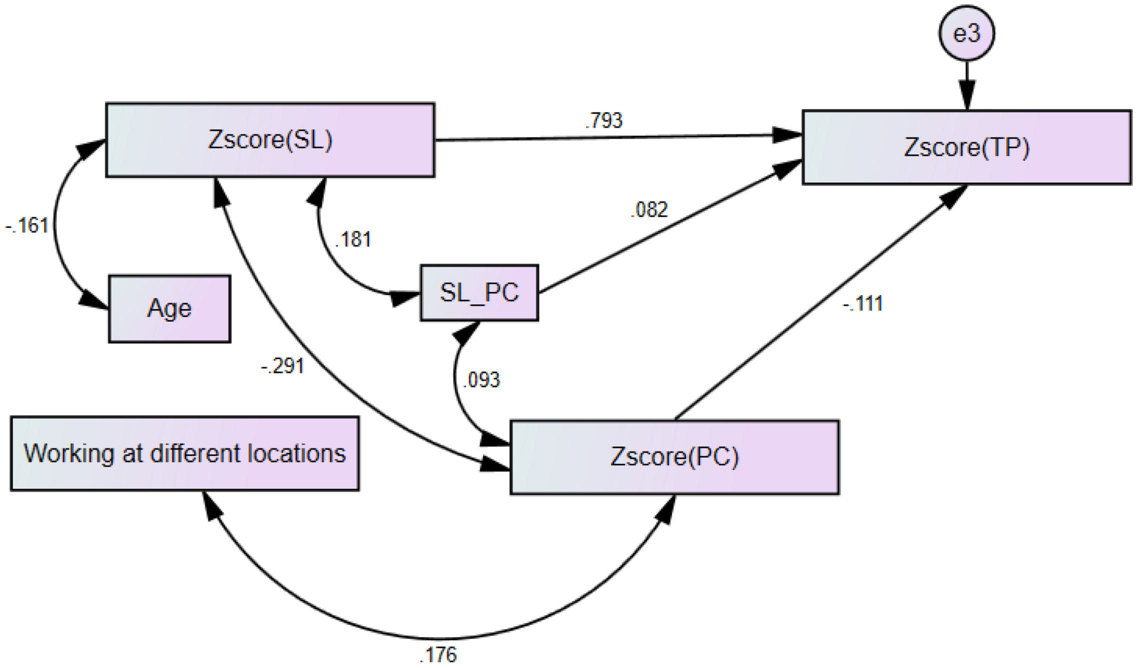
Note: ** p-value significant at smaller than .001 significance level or 99% confidence interval, * p-value at smaller than .05 significance level or 95% confidence interval. The factor loadings in parentheses are for the significance. Extraction Method: Maximum Likelihood. Indirect effect was tested using bias corrected bootstrap method with a Two Tailed Significance.

As can be seen from Table 5.19, the indirect effects of shared leadership on team performance is significant ($\beta = 0.028$, $p < 0.05$) and that perceived work complexity partially mediates the effect of shared leadership on team performance (reduces the regression weight). Sobel tests confirmed statistically significant mediation effects of perceived work complexity on shared leadership ($z = 2.16751636$, $p = 0.030$, two-tailed probability).

5.7.1.3 Moderation

Finally, to understand if how perceived work complexity reduces the effects of shared leadership on team performance it was decided to analyse if perceived work complexity can act as a moderator. Other studies have shown that one variable can act as both a mediator and moderator (James and Brett, 1984; Choi, Ullah, and Kwak, 2015; Kong, Zhao and You, 2013; Uysal, Satici, Satici, and Akin, 2014). This research created an interaction variable which was the product of the standardised score of shared leadership and perceived work complexity (Frazier, Tix, and Barron, 2004; Hayes, 2012). The model fits the data perfectly with fit statistics at: $\chi2 = 2.912$, $df = 7$, $\chi2/df = .416$, RMSEA = .000, PCLOSE = 0.970, GFI = 1, see Figure 5.4 below.

Figure 5.4 – Moderation model



The results exploring predictors of team performance showed that shared leadership (β = .793, p < .001) and perceived work complexity (β = -.111, p < .05) predicted significantly team performance, see Table 5.20 below. In this model, lower shared leadership and lower perceived work complexity were associated with lower team performance. Most importantly, there was a significant interaction between shared leadership and perceived work complexity (β = .082, p < .05).

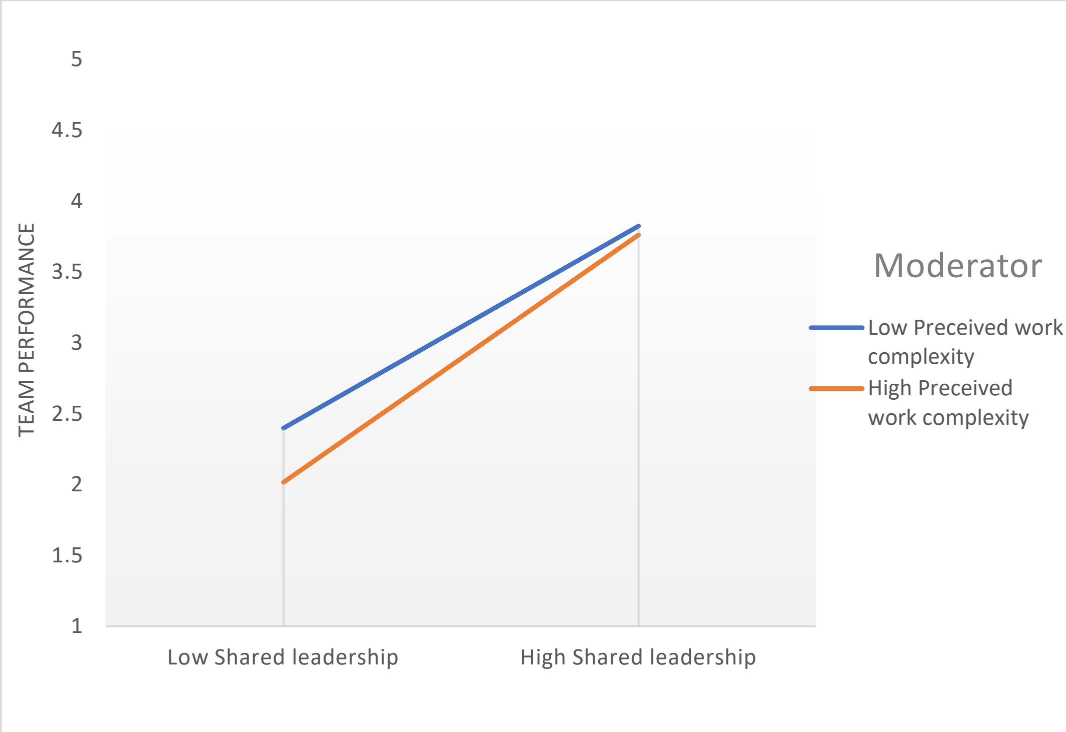
Table 5.20 - Regression weights

Relationship	Standardized regression weights
Team performance	
Shared leadership **	0.793 (0.000)
Perceived work complexity *	-0.111 (0.005)
Shared leadership x Perceived work complexity *	0.082 (0.031)

Note: ** p < 0.001, * p < 0.05

Consistent with procedures outlined by Dawson (2014), the researcher used the simple slope for the regression of team performance on share leadership by using the high and low values for perceived work complexity, high and low values are represented as one standard deviation above and below the mean respectively. As Figure 5.5 shows, there was a significant positive relation between shared leadership and team performance at high and low levels of perceived work complexity.

Figure 5.5 – Two-way interaction Moderation



5.8 Summary

After presenting the data screening as well as the profile of participants and the exploratory and confirmatory factor analysis to prove validity and reliability of the study's measures. SEM was used to test the hypotheses and assess the indirect and direct effects of the independent variables on the dependent variables.

As illustrated by Table 5.21, all hypotheses were supported, specifically perceived work complexity negatively predicts team performance, and shared leadership negatively predicts perceived work complexity and positively predicts team performance.

Table 5.21 - Table of Hypotheses and study Outcomes

Hypotheses		Outcome
Hypotheses H1	Perceived work complexity has a negatively effect on team performance	Supported
Hypotheses H2	Shared leadership has a negative effect on perceived work complexity	Supported
Hypotheses H3	Shared leadership has a positive effect on team performance	Supported

Additional analyses suggested that perceive work complexity partially mediated the effects of shared leadership on team performance. The partial mediating effect reduced the effect that shared leadership has on team performance. The moderating effect showed that there is a significant positive relation between shared leadership and team performance at high and low levels of perceived wok complexity. Also, that working at different locations has increases perceived work complexity and that age reduces perceptions of shared leadership.

The next chapter will discuss the results using the literature that was identified in chapter 2.

6 Discussion of results

6.1 Introduction

The previous chapter presented results to answer the proposed research questions of this study:

- Can perceived complexity be measured using the subjective ratings of IT employees?
- To what extent do the dimensions of perceived work complexity influence team performance?
- To what extent does shared leadership influence perceived work complexity?
- To what extent does shared leadership influence team performance?

To answer these questions, the study conceptualised a new scale for perceived work complexity, two existing dimensions of team performance, namely effectiveness and efficiency, and shared leadership. Three hypotheses were then developed to examine the interrelationships amongst the variables of perceived work complexity, team performance and shared leadership. The hypothesis tests show that IT employees who perceive their jobs as being more complex, also perceive their team performance as being lower. In addition, the extent to which shared leadership exists in teams lowered the perceived work complexity and increased team performance. Finally, shared leadership was found to be the strongest determinant of team performance. The next section discusses the hypotheses.

6.2 Perceived work complexity, team performance

This study drew on the literature (Chapter 2) and identified that perceived work complexity is a predictor of team performance. The following was postulated:

Hypotheses H1 - Perceived work complexity has a negative effect on team performance.

Hypothesis H1 was supported. Team performance is defined as the degree to which the team accomplished efficiency and effectiveness. Efficiency is defined as adherence to schedules, for example, starting the project on the target date and completing it on time and within budget. Effectiveness refers to the outcome quality and the degree to which expectations are met by the team (Hoegl and Gemuenden, 2001).

According to De Dreu and Weingart (2003) task complexity has been found to have a negative correlation with team performance. Espinosa et al. (2007) measured task complexity by looking at the actual size and lines of code in a software project as well as the number of modules affected by a change. Perceived work complexity in the current study is a higher level view of task complexity but is nevertheless built on the same understanding. The scale used to measure perceived work complexity relates to "the number of modules affected by a change", which includes, "Implementing a minor change in the project can produce disproportionately major consequences"; "Internal conditions related to the project changes constantly"; "Internal environmental influences are difficult to reverse in the project"; and "External environmental influences are difficult to reverse in the project". Results of this study confirmed this link, see Table 5.17 above. It was found that IT employees who reported higher levels of perceived work complexity experienced lower team performance.

6.3 Shared leadership, perceived work complexity

By drawing on the literature in Chapter 2 this study also found evidence to support links between shared leadership and perceived work complexity. The following was postulated:

Hypotheses H2 - Shared leadership has a negative effect on perceived work complexity.

This research created a latent construct called shared leadership based on three second-order factors: transformational, transactional, and directive shared leadership. A first-order and second-order factor model were tested; both models were mathematically equivalent (Table 5.14 - Fit indexes). According to Gerbing and Anderson (1984) a second-order factor model accounts for corrected errors amongst the covariation of first-order factors, very common in first-order CFA. If tenable, the second-order factor model is preferable.

Shared leadership is defined "as 'serial emergence' of multiple leaders over the life of a team" (Pearce and Sims, 2002, p.176). Pearce and Manz (2005) suggested that it would be more likely that shared leadership was needed for optimal performance the more complex the work becomes. This is because it is less likely that a single person can possess the expertise required for high performance in work that is more complex. Secondly, when work is more interdependent and knowledge-based, shared leadership promotes mutual learning and knowledge-sharing, which reduces work complexity (Shah et al., 2015). Finally, more complex work necessitates a higher degree of shared leadership to ensure team effectiveness (Wang, Waldman et al., 2014).

Results of this study confirmed this link, see Table 5.17 above. It was found that IT employees who reported higher levels of shared leadership experienced lower perceived work complexity ($\beta = -.297$, $p < .001$). Thus, Hypothesis H2 was supported.

6.4 Shared leadership, team performance

IS projects, such as software development, require extensive teamwork and high team performance. The environment is fraught with difficulties which makes it complex. It involves multiple interactions among elements, multiple actors, multiple actor roles, various degrees of freedom and multiple settings for distribution (Leonardi et al., 2016). Scholarly research by Wang and colleagues indicates that leadership style has a relationship with team performance (Wang, Tsai et al., 2014) and that more complex work necessitates a higher degree of shared leadership (Wang, Waldman et al., 2014). In the absence of shared leadership, complex work is even more complex, leading to negative team performance.

By drawing on the literature in Chapter 2 this study also found evidence to support links between shared leadership and team performance. The following was postulated:

Hypotheses H3 - Shared leadership has a positive effect on team performance.

Hypothesis H3 was supported. According to Wang, Tsai et al., (2014) shared leadership has been found to have a positive correlation with team performance. Results of the present study confirmed this link. It found that IT employees who reported higher levels of shared leadership experienced higher team performance. Shared leadership as a predictor of team performance in the context of information technology was confirmed, thus providing further support to this relationship.

6.5 Perceived work complexity as a mediator

This study also considered whether perceived work complexity could mediate the relationship between shared leadership and team performance. According to D'Innocenzo et al. (2016), teams performing tasks with higher levels of complexity exhibit lower effects of shared leadership on team performance. Results of this study partially confirmed this link. It was found that higher levels of perceived work complexity accounted for some, but not all, of the effect of shared leadership on team performance.

Previous research suggested that team cohesion affects the willingness, motivation and morale to engage in task-related and social activities, performance and ultimately group potency (Ensley, Pearson, and Pearce, 2003). Shared team leadership may have a negative effect in less cohesive teams and the opposite effect on performance in highly cohesive teams (Ensley et al., 2003; Mathieu, Kukenberger, D'Innocenzo, and Reilly, 2015).

6.6 Perceived work complexity as a moderator

This study also considered if perceived work complexity could moderate the relationship between shared leadership and team performance. Other studies have shown that one variable can act as both a mediator and moderator (James and Brett, 1984; Choi et al., 2015; Kong et al., 2013; Uysal et al., 2014).

As Figure 5.5 shows, there was a significant positive relationship between shared leadership and team performance at high and low levels of perceived work complexity. Shared leadership appears to be beneficial in terms of team performance for teams with high and low levels of perceived work complexity

6.7 Control variables

6.6.1 Working at different locations

This study also considered whether the fact that respondents worked at different locations (work on site as a percentage of my total time) during their work week influenced perceived work complexity. Results showed that working at different locations increased perceptions of work complexity.

6.7.2 Age

This study also found that age had a direct negative relationship with shared leadership. Results showed that more senior IT employees perceived less shared leadership than younger employees. The probable reason for this significant and quite weak relationship ($\beta = -0.186$, $p<0.05$, see Table 5.17) observed between age and shared leadership might be that older members do not seek many new ideas since they conform to the practices they have followed for a long time in their lives (Berhane, 2008). Older employees are probably more accepting of more autocratic styles while new generations might be more accepting of, and recognise, shared leadership.

6.7.3 Other controls

Other controls included gender, educational level, job level and organisational tenure. These control variables had no significant effect on perceived work complexity, shared leadership or team performance constructs.

6.8 Summary

Findings, including controls, suggest that perceived work complexity is important to team performance, and that shared leadership is important to both perceived work complexity and team performance. Perceived work complexity was found to partially mediate the relationship between shared leadership and team performance. Perceived work complexity was found to be a valid predictor of team performance of the IT employees surveyed.

A summary of the study, including the principal findings as well as the practical and academic implications, is presented in the next chapter. Limitations of this research and suggestions for future research are also discussed.

UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA

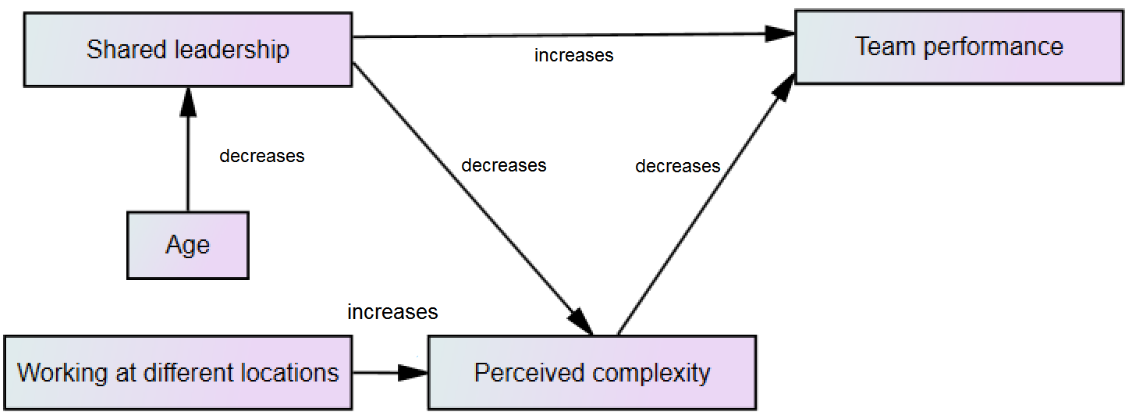
7 Conclusion

IS projects, such as software development, require extensive teamwork and high team performance. The IT environment can be extremely complex, as it involves multiple interactions, actors, roles and settings (Leonardi et al., 2016). Unfortunately, there has been limited focus on finding ways to manage complexity in systems, including IS systems, (Kerzner, 2013; Pucciarelli and Kaplan, 2016).

At the time of this study, no existing research could be found to explain how shared leadership could affect the team performance of information technology employees by changing their perceptions about the complexity of the work. Data from 204 responses from IT employees in South Africa were collected using an online questionnaire with a snow-ball sampling technique. The emergent model from the analysis is shown in Figure 7.1. Findings from this study showed that perceived work complexity negatively predicts team performance, while shared leadership negatively predicts perceived work complexity and positively predicts team performance. The findings also showed that not working 100% of your time in one specific environment increases perceptions of complexity and that more senior IT employees perceived less shared leadership than younger employees. Lastly, respondents' perceptions of complexity partially mediated the effects of shared leadership on team performance.

The implications for management, limitations of this research, and suggestions for future research are presented next.

Figure 7.1 - Revised Conceptual model



7.1 Implications for management

Managers of IS, or any other, systems should increase their understanding of how to lessen their employees' perceptions of work complexity, and increase team performance. IS is getting more complex as a result of structures and formalities that have developed over time (Nelson and Morris, 2014). This complexity is difficult to reduce, but it can be understood so that it is perceived as less complex. Managers need to look to other practical solutions to reduce perceptions of work complexity; for example, by breaking complex ideas down into palatable parts, or by acting as a buffer between clients' changing requirements and the team.

To manage this complexity, it is suggested that managers today should, firstly, and based on empirical results, understand perceptions of complexity, which can be reduced in the work environment by adopting shared leadership principles and increasing team performance. Managers could motivate, empower and give individuals a committed, shared purpose that has been shown to increase members’ willingness to share team leadership responsibilities (Carson, Tesluk, and Marrone, 2007).

Secondly, to increase team performance IT managers should adopt shared leadership principles to reduce IT employees’ perception of the complexity of projects within the work environment. By specifically adopting shared leadership principles, management could promote mutual learning and knowledge-sharing which reduces perceptions of complexity. It does this by encouraging participation; promoting conditions for an uninhibited and open exchange of information and ideas; promoting members’ sense of belonging to the community; creating space and time for exchanging expertise and stories; and teaching members of the community how to develop and the value of storytelling. In addition, norms and standards need to be clearly communicated for knowledge-sharing; these will also reduce uncertainty and associated anxiety about deciding what violates corporate rules, what constitutes acceptable sharing, and so on (Ardichvili, 2008). Then, mutual learning can be encouraged through the use of action learning. Action learning could be encouraged through reflecting on how the team is dealing with unfamiliar problems with real-time work experiences, which has been suggested as a gateway to shared leadership (Raelin, 2006).

Thirdly, when IT employees have a high perception of work complexity they have lower perceptions of team performance. This study focused on perception, and not actual work complexity. IT managers therefore need to understand their employees’ *perceptions* of work complexity and reduce the complexity in areas where individuals are struggling. Floricel et al. (2016) suggested that organisational strategies that foster collaboration, such as partnering and integrated project delivery (Naoum, 2003; Cohen, 2010), or encourage frequent communication, such as agile methods (Ballard and Tommelein, 2012), can be used for organising and addressing complexity-related uncertainties.

Lastly, it is suggested that IT managers should adopt shared leadership principles to reduce the perception of complexity.

Fourthly, this study found that working at different locations had a direct effect on employees' perceptions of complexity. IT managers should reduce the amount of time their employees spend at different locations, thus reducing perceptions of work complexity and increasing team performance. Dispersed teams need to bridge the technology-mediated and distance boundaries (Hinds and Bailey 2003), making it more difficult to work together. Their members need other ways to coordinate their work as the benefits of compresence, such as awareness, presence, contextual reference and frequent communication, are not enjoyed by dispersed teams, which could increase perceptions of work complexity. Espinosa et al. (2007) suggested that, regardless of location, team members that are more familiar with each other may obtain quicker responses and cooperation as they know who to contact to get questions answered. This can mitigate the negative effects of complexity on team performance. Espinosa et al. (2007) further suggested managers should make investments to develop team familiarity (for example, by using members that have worked together to form teams, visiting each other's sites frequently and implementing technologies that foster team familiarity, like video conferencing).

Lastly, this study showed that more senior IT employees perceived shared leadership as being lower in the work environment. If senior IT employees do not experience shared leadership this will reduce the shared leadership in the team and reduce team performance. The probable reason for this significant observation between age and shared leadership might be that older members do not seek new ideas as they follow their usual practices (Berhane, 2008). Older employees come from a time when more autocratic styles were acceptable while the new generations might be more accepting of shared leadership.

7.2 Limitations of the research

This research acknowledges the following limitations when considering the implications of the study. Firstly, a subjective rating approach was used to measure team performance. This research acknowledges this limitation because the use of objective instead of subjective ratings are preferable. D'Innocenzo et al. (2016), however, did not find any significant differences between shared leadership indices and members' ratings of team performance, so this risk was therefore reduced. Additionally, it was difficult to obtain data for objective measures and difficult to compare different measuring systems.

Perceptions about performance were therefore selected to measure team performance. Future research could use more objective measures

The problem of common method is a second limitation. Using only self-reported survey data could have biased the results. The potential error that affects different measures in a similar way, rather than two measures having a substantive relationship, is referred to as common method bias, that is, a correlation could be found to exist due to using the same survey instrument and the fact that the same respondent provided all the data for all variables. The design of this study, however, required responses from individuals themselves to test their perceptions of perceived work complexity, shared leadership and team performance. Furthermore, it has been suggested that single-item scales and poorly-designed scales are more susceptible to common method bias and less of a problem with multi-item, well-designed scales (Spector, 1987). By using scales with high reliability and multi-items, this concern is diminished.

Finally, the preferred random sampling method was supplemented with a snowball and convenience sampling approach. As a result, some caution is required when generalising to the larger population.

7.3 Suggestions for future research

Based on the findings, suggestions for future research follow.

Firstly, the importance of the perceived work complexity construct reported above was demonstrated. The study of perceived work complexity should thus be extended to include other variables not examined here. Perceived work complexity was measured using only four items from the original 11-item scale. Items forming part of the acceptable four-item scale include, “Implementing a minor change in the project can produce disproportionately major consequences”, “Internal conditions related to the project changes constantly”, “Internal environmental influences are difficult to reverse in the project”, and “External environmental influences are difficult to reverse in the project”. It could be perceived that this study might not have measured perceived complexity as a whole, but rather change complexity. As previously stated, the items used to measure perceived work complexity referred more to the change aspects of complexity.

Secondly, Pearce and Manz (2005) suggested that it would be more likely that shared leadership would be needed for optimal performance the more complex the work becomes. Then D’Innocenzo et al. (2016) suggested that it becomes too hard to manage shared leadership when tasks become more complex and more advantages can be achieved by having fewer leaders. This study supports both theories. First, perceived work complexity partially mediates the effects of shared leadership on team performance; second, when viewing perceived work complexity as a moderator, a positive relationship exists between shared leadership and team performance. Future research should explore and find other variables that can explain why shared leadership is slightly less effective when perceptions of work complexity are high. It could be that higher ratings on the perceived work complexity scale represented a chaotic system which related to high shared leadership being less effective. Future research should explore how shared leadership can be designed so that it is still effective when systems are chaotic.

Previous research suggested that team cohesion affects morale, willingness and motivation to engage in task-related and social activities, performance and, ultimately, group potency (Ensley et al., 2003). Ensley et al. (2003) also suggested that shared team leadership may have a negative effect in less cohesive teams and the opposite effect on performance in highly cohesive teams. Future research might want to explore other mediating variables like cohesion.

Lastly, future research may wish to better explore the relationship between perceived work complexity and actual work complexity and the study of actual team performance, rather than perceptions of team performance, is encouraged.

7.4 Last words

This study recognised that perceived work complexity is a problem for IT employees within South Africa. This problem was addressed through a research model to further our understanding of perceived work complexity, shared leadership and team performance of IT employees. By collecting valid and reliable data from IT employees in South Africa, the direct and indirect effects of shared leadership and perceived work complexity were demonstrated. Results supported the significant effects of shared leadership on team performance and perceived work complexity, and the importance of perceived work complexity on team performance. IT managers working in more complex environments with more non-managerial and technical level IT employees in service sectors could find the findings especially helpful. This study, as a result, has provided support and much needed empirical evidence on shared leadership of IT employees, added to the growing body of knowledge and provided new insights into perceived work complexity and team performance of IT employees in South Africa.

8 References

Anderson, J. C., & Gerbing, D. W. (1988). Structural equation modeling in practice: A review and recommended two-step approach. *Psychological Bulletin, 103*(3), 411-423.

Anderson, S. W., and Dekker, H. C. 2005. Management Control for Market Transactions: The Relation between Transaction Characteristics, Incomplete Contract Design, and Subsequent Performance. *Management Science, 51*(12), 1734-1752.

Ardichvili, A. (2008). Learning and knowledge sharing in virtual communities of practice: Motivators, barriers, and enablers. *Advances in developing human resources, 10*(4), 541-554.

Baard, S. K., Rench, T. A., & Kozlowski, S. W. (2014). Performance adaptation: A theoretical integration and review. *Journal of Management, 40*(1), 48-99.

Ballard, G., & Tommelein, I. (2012). Lean management methods for complex projects. *Engineering Project Organization Journal, 2*(1-2), 85-96.

Bartling, B., Fehr, E., & Herz, H. (2014). The intrinsic value of decision rights. *Econometrica*, 2005-2039.

Bass, B. M., & Bass, R. (2009). *The Bass handbook of leadership: Theory, research, and managerial applications*. Simon and Schuster.

Berhane, G. (2008). *Participatory Approach for the Development of Agribusiness Through Multi Purpose Cooperatives in Degua Tembien Woreda, South Eastern Tigray, Ethiopia* (Doctoral dissertation, Mekelle University).

Bhattacherjee, A. (2012). *Social science research: principles, methods, and practices*.

Bolden, R. (2011). Distributed leadership in organizations: A review of theory and research. *International Journal of Management Reviews, 13*(3), 251-269.

Bollen, K. A. (1989). A new incremental fit index for general structural equation models. *Sociological Methods & Research, 17*(3), 303-316.

Carson, J. B., Tesluk, P. E., & Marrone, J. A. (2007). Shared leadership in teams: An investigation of antecedent conditions and performance. *Academy of management Journal, 50*(5), 1217-1234.

Chen, Y., Bharadwaj, A., & Goh, K. Y. (2017). An empirical analysis of intellectual property right sharing in software development outsourcing. *MIS Quarterly, 41*(1), 131-161.

Cheung, G. W., & Lau, R. S. (2008). Testing mediation and suppression effects of latent variables: Bootstrapping with structural equation models. *Organizational Research Methods, 11*(2), 296-325.

Chin, W. W. (1998). Issues and opinion on structural equation modeling. *MIS Quarterly, 22*(1), vii-xvi.

Choi, S. B., Ullah, S. M., & Kwak, W. J. (2015). Ethical leadership and followers' attitudes toward corporate social responsibility: The role of perceived ethical work climate. *Social Behavior and Personality: an international journal, 43*(3), 353-365.

Cohen, J. (2010). Integrated project delivery: Case studies. *Sacramento, CA, The American Institute of Architects California Council*.

D'Innocenzo, L., Mathieu, J. E., & Kukenberger, M. R. (2016). A meta-analysis of different forms of shared leadership–team performance relations. Journal of Management, 42(7), 1964-1991.

Dawson, J. F. (2014). Moderation in management research- What, why, when, and how. *Journal of Business and Psychology, 29*(1), 1-19

De Dreu, C. K., & Weingart, L. R. (2003). Task versus relationship conflict, team performance, and team member satisfaction: a meta-analysis. *Journal of Applied Psychology, 88*(4), 741-749.

DeVellis, R. F. (2016). *Scale development: Theory and applications* (Vol. 26). Sage publications.

Ensley, M. D., Pearson, A., & Pearce, C. L. (2003). Top management team process, shared leadership, and new venture performance: A theoretical model and research agenda. *Human Resource Management Review, 13*(2), 329-346.

Espinosa, J. A., Slaughter, S. A., Kraut, R. E., & Herbsleb, J. D. (2007). Familiarity, complexity, and team performance in geographically distributed software development. *Organization science, 18*(4), 613-630.

Floricel, S., Michela, J. L., & Piperca, S. (2016). Complexity, uncertainty-reduction strategies, and project performance. *International Journal of Project Management, 34*(7), 1360-1383.

Fornell, C., & Bookstein, F. L. (1982). Two structural equation models: LISREL and PLS applied to consumer exit-voice theory. *Journal of Marketing Research, 19*(4), 440-452.

Fornell, C., & Larcker, D. (1987). A second generation of multivariate analysis: Classification of methods and implications for marketing research. *Review of marketing, 1*, 407-450.

Frazier, P. A., Tix, A. P., & Barron, K. E. (2004). Testing moderator and mediator effects in counseling psychology research. Journal of counseling psychology, 51(1), 115.

Freeze, R. D., & Raschke, R. L. (2007). An assessment of formative and reflective constructs in IS research. *In Proceedings of the European Conference on Information Systems (ECIS '07)*, 1481–1492. University of St. Gallen.

Friedrich, T. L., Vessey, W. B., Schuelke, M. J., Mumford, M. D., Yammarino, F. J., & Ruark, G. A. (2014). Collectivistic leadership and George C. Marshall: A historiometric analysis of career events. *The Leadership Quarterly*, *25*(3), 449-467.

Gefen, D., Rigdon, E. E., & Straub, D. (2011). An update and extension to SEM guidelines for administrative and social science research. *MIS Quarterly, 35*(2), iii–xiv.

Gefen, D., Straub, D. W., & Boudreau, M.-C. (2000). Structural equation modeling and regression: Guidelines for research practice. *Communications of the AIS, 4*(7), 1- 80.

George, D., & Mallery, P. (2010). *SPSS for Windows step by step. A simple study guide and reference (10. Baskı)*.

Geraldi, J., Maylor, H., & Williams, T. (2011). Now, let's make it really complex (complicated) A systematic review of the complexities of projects. *International Journal of Operations & Production Management, 31*(9), 966-990.

Gerbing, D. W., & Anderson, J. C. (1984). On the meaning of within-factor correlated measurement errors. *Journal of Consumer Research, 11*(1), 572-580.

Geraldi, J., Maylor, H., & Williams, T. (2011). Now, let's make it really complex (complicated) A systematic review of the complexities of projects.*International Journal of Operations & Production Management*, *31*(9), 966-990.

Gliem, R. R., & Gliem, J. A. (2003). Calculating, interpreting, and reporting Cronbach's alpha reliability coefficient for Likert-type scales. Midwest Research-to-Practice Conference in Adult, Continuing, and Community Education.

Graen, G. B., & Uhl-Bien, M. (1995). Relationship-based approach to leadership: Development of leader-member exchange (LMX) theory of leadership over 25 years: Applying a multi-level multi-domain perspective. *The leadership quarterly, 6*(2), 219-247.

Grewal, R., Cote, J. A., & Baumgartner, H. (2004). Multicollinearity and measurement error in structural equation models: Implications for theory testing. *Marketing Science, 23*(4), 519-529.

Gunzler, D., Chen, T., Wu, P., & Zhang, H. (2013). Introduction to mediation analysis with structural equation modeling. *Shanghai archives of psychiatry, 25*(6), 390.

Hair, J., Black, W., Babin, B. & Anderson, R. 2010. *Multivariate Data Analysis. 7 ed*. New Jersey: Pearson Prentice Hall.

Hair, J. F., Ringle, C. M., & Sarstedt, M. (2011). PLS-SEM: Indeed a silver bullet. *Journal of Marketing Theory and Practice, 19(*2), 139–151.

Hair, J.F., Wolfinbarger Celsi, M., Money, A. H., Samouel, P. & Page, M.J. (2015). *Essentials of Business Research Methods.* 2nd Edition, London & New York: Routledge.

Harlow, L. L. (2014). The essence of multivariate thinking: Basic themes and methods (2nd ed.). New York: Routledge.

Hayes, A. F. (2012). PROCESS: A versatile computational tool for observed variable mediation, moderation, and conditional process modeling.

Hoch, J. E., & Kozlowski, S. W. (2014). Leading virtual teams: Hierarchical leadership, structural supports, and shared team leadership. *Journal of applied psychology*, *99*(3), 390.

Hoegl, M., & Gemuenden, H. G. (2001). Teamwork quality and the success of innovative projects: A theoretical concept and empirical evidence. *Organization science*, *12*(4), 435-449.

Hu, L. T., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural equation modeling: a multidisciplinary journal, 6*(1), 1-55.

James, L. R., & Brett, J. M. (1984). Mediators, moderators, and tests for mediation. *Journal of Applied Psychology, 69*(2), 307.

Kang, H., Zhang, A., Cai, T. T., & Small, D. S. (2016). Instrumental variables estimation with some invalid instruments and its application to Mendelian randomization. *Journal of the American Statistical Association, 111*(513), 132-144.

Kemp, N. J., Wall, T. D., Clegg, C. W., & Cordery, J. L. (1983). Autonomous work groups in a greenfield site: A comparative study. *Journal of Occupational psychology, 56*(4), 271-288.

Kerzner, H. (2013). *Project management: a systems approach to planning, scheduling, and controlling*. John Wiley & Sons.

Kong, F., Zhao, J., & You, X. (2013). Self-esteem as mediator and moderator of the relationship between social support and subjective well-being among Chinese university students. *Social Indicators Research, 112*(1), 151-161.

James, L. R., & Brett, J. M. (1984). Mediators, moderators, and tests for mediation. *Journal of Applied Psychology, 69*(2), 307.

Jarvis, C. B., Mackenzie, S. B., & Podsakoff, P. M. (2003). A critical review of construct indicators and measurement model misspecification in marketing and consumer research. *Journal of Consumer Research, 30*(2), 199–218.

Leonardi, P. M., Bailey, D. E., Diniz, E. H., Sholler, D., & Nardi, B. (2016). Multiplex Appropriation in Complex Systems Implementation: The Case of Brazil's Correspondent Banking System. *MIS Quarterly*, *40*(2), 461-473.Lord, R. G., Day, D. V., Zaccaro, S. J., Avolio, B. J., & Eagly, A. H. (2017). Leadership in applied psychology: three waves of theory and research. Journal of Applied Psychology, 102(3), 434-451.

Luftman, J., Zadeh, H. S., Derksen, B., Santana, M., Rigoni, E. H., & Huang, Z. D. (2013). Key information technology and management issues 2012–2013: an international study. *Journal of Information Technology, 28*(4), 354-366.

Mathieu, J. E., Kukenberger, M. R., D'Innocenzo, L., & Reilly, G. (2015). Modeling reciprocal team cohesion–performance relationships, as impacted by shared leadership and members' competence. *Journal of Applied Psychology*, *100*(3), 713.

Mattsson, S., Li, D., Fast-Berglund, Å., & Gong, L. (2017). Measuring Operator Emotion Objectively at a Complex Final Assembly Station. *In Advances in Neuroergonomics and Cognitive Engineering* (pp. 223-232). Springer International Publishing.

Metcalf, L., & Benn, S. (2012). The corporation is ailing social technology: Creating a 'fit for purpose' design for sustainability. *Journal of Business Ethics, 111*(2), 195-210

Metcalf, L., & Benn, S. (2013). Leadership for sustainability: An evolution of leadership ability. *Journal of Business Ethics*, *112*(3), 369-384.

Morgeson, F. P., DeRue, D. S., & Karam, E. P. (2010). Leadership in teams: A functional approach to understanding leadership structures and processes. *Journal of management, 36*(1), 5-39.

Naoum, S. (2003). An overview into the concept of partnering. *International journal of project management, 21*(1), 71-76.

Nelson, R. R., & Morris, M. G. (2014). IT Project Estimation: Contemporary Practices and Management Guidelines. *MIS Quarterly Executive, 13*(1).

Pearce, C. L. (2004). The future of leadership: Combining vertical and shared leadership to transform knowledge work. *The Academy of Management Executive, 18*(1), 47-57.

Pearce, C. L., & Manz, C. C. 2005. The new silver bullets of leadership: The importance of self- and shared leadership in knowledge work. *Organizational Dynamics, 34*. 130-140.

Pearce, C. L., & Sims, H. P. (2002). Vertical versus shared leadership as predictors of the effectiveness of change management teams: An examination of aversive, directive, transactional, transformational and empowering leader behaviors. *Group Dynamics: Theory, Research, and Practice, 6*(2), 172–197.

Preacher, K. J., & Hayes, A. F. (2008). Asymptotic and resampling strategies for assessing and comparing indirect effects in multiple mediator models. *Behavior Research Methods, 40*(3), 879–891.

Pucciarelli, F., & Kaplan, A. (2016). Competition and strategy in higher education: Managing complexity and uncertainty. *Business Horizons*, *59*(3), 311-320.

Raelin, J. (2006). Does action learning promote collaborative leadership?. *Academy of Management Learning & Education, 5*(2), 152-168.

Ringle, C. M., Sarstedt, M., & Straub, D. W. (2012). A critical look at the use of PLS-SEM in MIS Quarterly. *MIS Quarterly, 36*(1), iii–xiv.

Roepke, R., Agarwal, R., & Ferratt, T. W. (2000). Aligning the IT human resource with business vision: the leadership initiative at 3M. *MIS Quarterly, 24*(2), 327-353.

Rouse, W. B. (2003). Engineering complex systems: Implications for research in systems engineering. *IEEE Transactions on Systems, Man, and Cybernetics, Part C (Applications and Reviews), 33*(2), 154-156.

Rouse, W.B. (2007). Complex engineered, organizational & natural systems: Issues underlying the complexity of systems and fundamental research needed to address these issues. *Systems Engineering, 10* (3), 260-271.

Rouse, W. B., & Serban, N. (2011). Understanding change in complex socio-technical systems. *Information Knowledge Systems Management, 10*(1-4), 25-49.

Saunders, M., & Lewis, P (2012). *Doing Research in Business and Management: An essential guide to planning your project.* Pearson: Edinburgh Gate.

Schwarz, R.L., Barros, E., Behnke, A., Chang, Y., Christiansen, A., Faber, A., Kwon, Y.I., Johnson-Mehta, A., Beal, D., MacDermid, S.M., & Weiss, H.M., (2004). MFRI Resources for Researchers.

Shah, N. P., Cross, R., & Levin, D. Z. (2015). Performance benefits from providing assistance in networks relationships that generate learning. *Journal of Management*, 0149206315584822.

Snowden, D. J., & Boone, M. E. (2007). A leader's framework for decision making. *Harvard business review, 85*(11), 68.

Tal, D., & Gordon, A. (2016). Leadership of the present, current theories of multiple involvements: a bibliometric analysis. *Scientometrics*, *107*(1), 259-269.

Tian, R. (2013). *Effect of work complexity & individual differences on nursing IT utilization* (Doctoral dissertation, Purdue University).

Uhl-Bien, M., Marion, R., & McKelvey, B. (2007). Complexity leadership theory: Shifting leadership from the industrial age to the knowledge era. *The leadership quarterly, 18*(4), 298-318.

Uysal, R., Satici, S. A., Satici, B., & Akin, A. (2014). Subjective Vitality as Mediator and Moderator of the Relationship between Life Satisfaction and Subjective Happiness. *Educational Sciences: Theory and Practice, 14*(2), 489-497.

Wang, C. J., Tsai, H. T., & Tsai, M. T. (2014). Linking transformational leadership and employee creativity in the hospitality industry: The influences of creative role identity, creative self-efficacy, and job complexity. *Tourism Management*, *40*, 79-89.

Wang, D., Waldman, D. A., & Zhang, Z. (2014). A meta-analysis of shared leadership and team effectiveness. *Journal of Applied Psychology*, *99*(2), 181.

Whitson, J. A., & Galinsky, A. D. (2008). Lacking control increases illusory pattern perception. Science, 322(5898), 115-117.

Zhao, X., Lynch Jr, J. G., & Chen, Q. (2010). Reconsidering Baron and Kenny: Myths and truths about mediation analysis. *Journal of consumer research, 37*(2), 197-206.

9 Appendices

9.1 Appendix 1 - Perceived Complexity

Snowden and Boone (2007)	**Perceived complexity scale (7 point Likert scale - Strongly disagree, Disagree, Disagree Somewhat, neither agree nor disagree, agree somewhat, Agree, strongly agree)**
It involves large numbers of interacting elements	The system has a large number of interacting elements
The interactions are nonlinear, and minor changes can produce disproportionately major consequences	Implementing a minor change can produce disproportionately major consequences
The system is dynamic, the whole is greater than the sum of its parts	The system is dynamic, the whole is greater than the sum of its parts
The system has a history, and the past is integrated with the present	The system has a history, and the past is integrated with the present
The elements evolve with one another and with the environment	The elements in the system evolve with one another and with the environment
This evolution is irreversible	This evolution is difficult to reverse
Though a complex system may, in retrospect, appear to be ordered and predictable, hindsight does not lead to foresight because the external conditions and systems constantly change.	External conditions related to the systems changes constantly

In a complex system the agents and the system constrain one another, especially over time	External conditions constrained the systems

9.2 Appendix 2 - Item Scales

Perceived Complexity - Internal (PCI)		
PCI1	The project has a large number of interacting elements	Strongly disagree, Disagree, Somewhat disagree, Neither agree nor disagree, Somewhat agree, Agree, Strongly agree
PCI2	Implementing a minor change in the project can produce disproportionately major consequences	Strongly disagree, Disagree, Somewhat disagree, Neither agree nor disagree, Somewhat agree, Agree, Strongly agree
PCI3	The project is dynamic, the whole is greater than the sum of its parts	Strongly disagree, Disagree, Somewhat disagree, Neither agree nor disagree, Somewhat agree, Agree, Strongly agree
PCI4	Internal conditions related to the project changes constantly	Strongly disagree, Disagree, Somewhat disagree, Neither agree nor disagree, Somewhat agree, Agree, Strongly agree
PCI5	The internal elements in the project evolve with one another	Strongly disagree, Disagree, Somewhat disagree, Neither agree nor disagree, Somewhat agree, Agree, Strongly agree
PCI6	Internal environmental influences are difficult to reverse in the project	Strongly disagree, Disagree, Somewhat disagree, Neither agree nor disagree, Somewhat agree, Agree, Strongly agree
PCI7	External conditions related to the project changes constantly	Strongly disagree, Disagree, Somewhat disagree, Neither agree nor disagree, Somewhat agree, Agree, Strongly agree
PCI8	External conditions constrain the project	Strongly disagree, Disagree, Somewhat disagree, Neither agree nor disagree, Somewhat agree, Agree, Strongly agree

PCI9	The project has a history, and the past is integrated with the present	Strongly disagree, Disagree, Somewhat disagree, Neither agree nor disagree, Somewhat agree, Agree, Strongly agree
PCI10	The elements in the project evolve with the external environment	Strongly disagree, Disagree, Somewhat disagree, Neither agree nor disagree, Somewhat agree, Agree, Strongly agree
PCI11	External environmental influences are difficult to reverse in the project	Strongly disagree, Disagree, Somewhat disagree, Neither agree nor disagree, Somewhat agree, Agree, Strongly agree

Shared leadership - Transformational (SLF)

SLTF1	My team members show enthusiasm for my efforts	Strongly disagree, Disagree, Somewhat disagree, Neither agree nor disagree, Somewhat agree, Agree, Strongly agree
SLTF2	My team members approach a new project or task in an enthusiastic way	Strongly disagree, Disagree, Somewhat disagree, Neither agree nor disagree, Somewhat agree, Agree, Strongly agree
SLTF3	My team members stress the importance of our team to the larger organisation	Strongly disagree, Disagree, Somewhat disagree, Neither agree nor disagree, Somewhat agree, Agree, Strongly agree
SLTF4	My team members expect me to perform at my highest level	Strongly disagree, Disagree, Somewhat disagree, Neither agree nor disagree, Somewhat agree, Agree, Strongly agree
SLTF5	My team members encourage me to go above and beyond what is normally expected of one (e.g., extra effort)	Strongly disagree, Disagree, Somewhat disagree, Neither agree nor disagree, Somewhat agree, Agree, Strongly agree
SLTF6	My team members expect me to give 100% all of the time	Strongly disagree, Disagree, Somewhat disagree, Neither agree nor disagree, Somewhat agree, Agree, Strongly agree
SLTF7	My team members provide a clear vision of where our team is going	Strongly disagree, Disagree, Somewhat disagree, Neither agree nor disagree, Somewhat agree, Agree, Strongly agree
SLTF8	My team members provide a clear vision of who and what our team is	Strongly disagree, Disagree, Somewhat disagree, Neither agree nor disagree, Somewhat agree, Agree, Strongly agree

SLTF9	Because of my team members, I have a clear vision of our team's purpose	Strongly disagree, Disagree, Somewhat disagree, Neither agree nor disagree, Somewhat agree, Agree, Strongly agree
SLTF10	My team members aren't afraid to 'break the mold' to find different ways of doing things	Strongly disagree, Disagree, Somewhat disagree, Neither agree nor disagree, Somewhat agree, Agree, Strongly agree
SLTF11	My team members are non-traditional types that "shakes up the system" when necessary	Strongly disagree, Disagree, Somewhat disagree, Neither agree nor disagree, Somewhat agree, Agree, Strongly agree
SLTF12	My team members aren't afraid to "buck the system" if they think it is necessary	Strongly disagree, Disagree, Somewhat disagree, Neither agree nor disagree, Somewhat agree, Agree, Strongly agree
Shared leadership - Directive leadership (SLD)		
SLDR1	When it comes to my work, my team members give me instructions on how to carry it out	Strongly disagree, Disagree, Somewhat disagree, Neither agree nor disagree, Somewhat agree, Agree, Strongly agree
SLDR2	My team members give me instructions about how to do my work	Strongly disagree, Disagree, Somewhat disagree, Neither agree nor disagree, Somewhat agree, Agree, Strongly agree
SLDR3	My team members provide commands in regard to my work	Strongly disagree, Disagree, Somewhat disagree, Neither agree nor disagree, Somewhat agree, Agree, Strongly agree
SLDR4	My team members establish my performance goals	Strongly disagree, Disagree, Somewhat disagree, Neither agree nor disagree, Somewhat agree, Agree, Strongly agree
SLDR5	My team members set the goals for my performance	Strongly disagree, Disagree, Somewhat disagree, Neither agree nor disagree, Somewhat agree, Agree, Strongly agree
SLDR6	My team members establish the goals for my work	Strongly disagree, Disagree, Somewhat disagree, Neither agree nor disagree, Somewhat agree, Agree, Strongly agree

SLDR7	My team members let me know about it when I perform poorly	Strongly disagree, Disagree, Somewhat disagree, Neither agree nor disagree, Somewhat agree, Agree, Strongly agree
SLDR8	My team members reprimand me when my performance is not up to par	Strongly disagree, Disagree, Somewhat disagree, Neither agree nor disagree, Somewhat agree, Agree, Strongly agree
SLDR9	When my work is not up to par, my team members points (point it out to me	Strongly disagree, Disagree, Somewhat disagree, Neither agree nor disagree, Somewhat agree, Agree, Strongly agree
Shared leadership - Transactional leadership (SLS)		
SLTX 1	My team members give me positive feedback when I perform well	Strongly disagree, Disagree, Somewhat disagree, Neither agree nor disagree, Somewhat agree, Agree, Strongly agree
SLTX 2	My team members commend me when I do a better-than-average job	Strongly disagree, Disagree, Somewhat disagree, Neither agree nor disagree, Somewhat agree, Agree, Strongly agree
SLTX 3	My team members give me special recognition when my work performance is especially good	Strongly disagree, Disagree, Somewhat disagree, Neither agree nor disagree, Somewhat agree, Agree, Strongly agree
SLTX 4	My team members will recommend that I am compensated well if I perform well	Strongly disagree, Disagree, Somewhat disagree, Neither agree nor disagree, Somewhat agree, Agree, Strongly agree
SLTX 5	My team members will recommend that I am compensated more if I perform well	Strongly disagree, Disagree, Somewhat disagree, Neither agree nor disagree, Somewhat agree, Agree, Strongly agree
SLTX6	If I perform well, my team members will recommend more compensation	Strongly disagree, Disagree, Somewhat disagree, Neither agree nor disagree, Somewhat agree, Agree, Strongly agree
Team Performance - Effectiveness (TPT)		
TPEF1	Going by the results, this project can be or will be regarded as successful	Strongly disagree, Disagree, Somewhat disagree, Neither agree nor disagree, Somewhat agree, Agree, Strongly agree

TPEF2	All demands of the customers have been or will be satisfied	Strongly disagree, Disagree, Somewhat disagree, Neither agree nor disagree, Somewhat agree, Agree, Strongly agree
TPEF3	From the company's perspective, all project goals were or will be achieved	Strongly disagree, Disagree, Somewhat disagree, Neither agree nor disagree, Somewhat agree, Agree, Strongly agree
TPEF4	The performance of our team advanced or advances our image to the customer	Strongly disagree, Disagree, Somewhat disagree, Neither agree nor disagree, Somewhat agree, Agree, Strongly agree
TPEF5	The project result was or will be of high quality	Strongly disagree, Disagree, Somewhat disagree, Neither agree nor disagree, Somewhat agree, Agree, Strongly agree
TPEF6	The customer was or will be satisfied with the quality of the project result	Strongly disagree, Disagree, Somewhat disagree, Neither agree nor disagree, Somewhat agree, Agree, Strongly agree
TPEF7	The team was or will be satisfied with the project result	Strongly disagree, Disagree, Somewhat disagree, Neither agree nor disagree, Somewhat agree, Agree, Strongly agree
TPEF8	The project result required or will require little rework	Strongly disagree, Disagree, Somewhat disagree, Neither agree nor disagree, Somewhat agree, Agree, Strongly agree
TPEF9	The project result proved or will prove to be stable in operation	Strongly disagree, Disagree, Somewhat disagree, Neither agree nor disagree, Somewhat agree, Agree, Strongly agree
TPEF10	The project result proved or will prove to be robust in operation	Strongly disagree, Disagree, Somewhat disagree, Neither agree nor disagree, Somewhat agree, Agree, Strongly agree
Team Performance - Efficiency (TPC)		
TPEC1	From the company's perspective one could be or will be satisfied with how the project progressed	Strongly disagree, Disagree, Somewhat disagree, Neither agree nor disagree, Somewhat agree, Agree, Strongly agree
TPEC2	Overall, the project was done or has been done in a cost-efficient way	Strongly disagree, Disagree, Somewhat disagree, Neither agree nor disagree, Somewhat agree, Agree, Strongly agree

TPEC3	Overall, the project was done or has been done in a time-efficient way	Strongly disagree, Disagree, Somewhat disagree, Neither agree nor disagree, Somewhat agree, Agree, Strongly agree
TPEC4	The project was or is within schedule	Strongly disagree, Disagree, Somewhat disagree, Neither agree nor disagree, Somewhat agree, Agree, Strongly agree
TPEC5	The project was or is within budget	Strongly disagree, Disagree, Somewhat disagree, Neither agree nor disagree, Somewhat agree, Agree, Strongly agree

Controls

A	What is your current age?	• Below 20 years • Between 20 - 30 years • Between 30 - 40 years • Between 40 - 50 years • Between 50 - 60 years • Above 60 years
G	What is your gender?	• Male • Female • Prefer not to say
LE	What is your highest level of education?	• Less than high school • High school • Some college • Technical degree • Bachelor's degree • Some graduate courses • Master's degree • Post-master's courses • Doctoral degree • Other, please specify
T	How many years have you been with your organisation?	• Between 0 – 3 years • Between 3 – 5 years • Between 5 – 10 years • 10 years or more
LM	On which level in the organisation are you?	• One level below the CEO • Two levels below the CEO • Three levels below the CEO • Four or more levels below the CEO
D	What is your IT role?	• Programmer • Information system professional • Developer • Systems analyst • Systems designer

		• MIS engineer • Software engineer • Software architect • Data processing professional • Business intelligence analyst • Test Analyst • Project manager
P	A project for this study is defined as a series of technical and managerial work activities that should meet the terms and conditions listed in the project agreement. Please name the current project that you are working on (if you are working on more than one project please name the one with the highest priority)	Free text field
WS1	I work on site (i.e. working at the client offices) as a percentage of my total time.	[Percentage slider]

9.3 Appendix 3 - Consistency Matrix

Table A3 - Consistency Matrix

Hypotheses	**Literature review**	**Data collection tool**	**Analysis**
H1 - Perceived work complexity has a negatively effect on team performance	Espinosa et al. (2007)	PC, TPEF, TPEC in a Likert scale questionnaire	SEM Exploratory factor analysis Confirmatory factor analysis Cronbach's alpha
H2 - Shared leadership has a negative effect on perceived work complexity	Wang, Waldman et al. (2014); Shah, et al. (2015)	PC, SL in a Likert scale questionnaire	SEM Exploratory factor analysis Confirmatory factor analysis Cronbach's alpha
H3 - Shared leadership has a positive effect on team performance	Pearce and Sims (2002):	SL, TPEF, TPEC in a Likert scale questionnaire	SEM Exploratory factor analysis Confirmatory factor analysis

			Cronbach's alpha Moderation Multicollinearity

9.4 Appendix 4 - Informed consent letter

I am conducting research on the impact of perceived work complexity, shared leadership and on team performance of IT employees of South African firms. To that end, you are asked to complete a online survey. This will help us better understand perceived work complexity, shared leadership, and team performance, and should take no more than 20 minutes of your time. Your participation is voluntary and you can withdraw at any time without penalty. All data will be kept confidential. By completing the survey, you indicate that you voluntarily participate in this research. If you have any concerns, please contact my supervisor or me. Our details are provided below.

Researcher name	Christiaan Storm	**Research Supervisor Signature**	Dr Caren Scheepers
Email	16391561@mygibs.co.za	**Email**	scheepersc@gibs.co.za
Phone	+27 79 495 8067	**Phone**	+27 11 771 4228

9.5 Appendix 5 - Missing data

Table 5.1 - Missing Patterns (cases with missing values)

Case	# Missing	% Missing
3	1	2.2
7	1	2.2
90	1	2.2
130	1	2.2
157	1	2.2
180	1	2.2
191	1	2.2
194	1	2.2
207	1	2.2

185	2	4.4
147	1	2.2
169	1	2.2
45	1	2.2
10	2	4.4
123	2	4.4
97	1	2.2
66	1	2.2
67	1	2.2
134	1	2.2
55	1	2.2
56	1	2.2
181	1	2.2
135	1	2.2
78	1	2.2
126	1	2.2
18	1	2.2
61	1	2.2
163	1	2.2
24	1	2.2
174	1	2.2
34	1	2.2
182	1	2.2
43	1	2.2
199	2	4.4
139	4	8.9
206	5	11.1
167	19	42.2
209	12	26.7
41	27	60.0
162	38	84.4
35	39	86.7

- indicates an extreme low value, while + indicates an extreme high value. The range used is (Q1 - 1.5*IQR, Q3 + 1.5*IQR).
a. Cases and variables are sorted on missing patterns.

Table 5.2 - Univariate Statistics

	N	Mean	Std. Deviation	Missing		No. of Extremes[a]	
				Count	Percent	Low	High
PC1	208	6.07	1.272	2	1.0	20	0
PC2	208	4.58	1.863	2	1.0	0	0
PC3	207	5.61	1.295	3	1.4	15	0
PC4	207	4.57	1.714	3	1.4	0	0
PC5	207	5.15	1.287	3	1.4	24	0
PC6	206	4.22	1.520	4	1.9	0	0
PC7	208	4.79	1.607	2	1.0	2	0
PC8	208	4.82	1.556	2	1.0	3	0
PC9	208	5.41	1.458	2	1.0	21	0
PC10	207	5.13	1.370	3	1.4	4	0
PC11	208	4.53	1.519	2	1.0	4	0
SLTF1	205	5.62	1.291	5	2.4	8	0
SLTF2	205	5.54	1.285	5	2.4	18	0
SLTF3	205	5.23	1.311	5	2.4	1	0
SLTF4	204	6.17	0.955	6	2.9	11	0
SLTF5	205	5.56	1.314	5	2.4	7	0
SLTF6	205	5.70	1.247	5	2.4	4	0
SLTF7	204	4.99	1.502	6	2.9	4	0
SLTF8	204	5.17	1.423	6	2.9	2	0
SLTF9	205	5.14	1.586	5	2.4	5	0
SLTF10	205	5.39	1.503	5	2.4	11	0
SLTF11	203	5.01	1.549	7	3.3	7	0
SLTF12	201	4.81	1.498	9	4.3	7	0
TPEF1	207	5.72	1.292	3	1.4	7	0
TPEF2	207	5.48	1.321	3	1.4	19	0
TPEF3	207	5.50	1.375	3	1.4	22	0
TPEF4	207	5.66	1.359	3	1.4	8	0
TPEF5	207	5.60	1.299	3	1.4	16	0
TPEF6	207	5.66	1.171	3	1.4	9	0
TPEF7	207	5.65	1.118	3	1.4	8	0
TPEF8	207	4.48	1.663	3	1.4	0	0
TPEF9	204	5.63	1.161	6	2.9	12	0
TPEF10	206	5.51	1.252	4	1.9	13	0

TPEC1	205	5.43	1.253	5	2.4	18	0
TPEC2	205	4.99	1.443	5	2.4	7	0
TPEC3	205	4.85	1.642	5	2.4	8	0
TPEC4	205	4.81	1.723	5	2.4	8	0
TPEC5	202	4.83	1.520	8	3.8	7	0
Workonsite	209			1	0.5		
Age	210			0	0.0		
Education	201			9	4.3		
Gender	210			0	0.0		
Tenure	209			1	0.5		
Level	205			5	2.4		
Role	210			0	0.0		

a. Number of cases outside the range (Q1 - 1.5*IQR, Q3 + 1.5*IQR).

Table 5.3 - Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Zscore(Age)	205	-0.88101	3.04522	0.0	1.00
Zscore(Education)	205	-1.94269	2.42000	0.0	1.00
Zscore(Gender)	205	-0.47089	4.23803	0.0	1.00
Zscore(Role)	205	-1.66217	2.24162	0.0	1.00
Zscore(Tenure)	205	-0.74582	2.39582	0.0	1.00
Zscore(Level)	205	-0.66617	2.39125	0.0	1.00
Zscore(WorkOnSite)	205	-1.18742	1.08051	0.0	1.00
Zscore: PC1	205	-3.95899	0.74135	0.0	1.00
Zscore: PC2	205	-1.90277	1.30327	0.0	1.00
Zscore: PC3	205	-3.54581	1.08113	0.0	1.00
Zscore: PC4	205	-2.07118	1.42072	0.0	1.00
Zscore: PC5	205	-3.22334	1.44573	0.0	1.00
Zscore: PC6	205	-2.13645	1.84854	0.0	1.00
Zscore: PC7	205	-2.37805	1.36715	0.0	1.00
Zscore: PC8	205	-2.44873	1.39794	0.0	1.00
Zscore: PC9	205	-3.00138	1.08688	0.0	1.00
Zscore: PC10	205	-2.99617	1.37028	0.0	1.00
Zscore: PC11	205	-2.32112	1.61136	0.0	1.00
Zscore: SLTF1	205	-3.58163	1.06542	0.0	1.00
Zscore: SLTF2	205	-3.53396	1.13497	0.0	1.00

Zscore: SLTF3	205	-3.22905	1.34668	0.0	1.00
Zscore: SLTF4	205	-4.38061	0.86994	0.0	1.00
Zscore: SLTF5	205	-2.70902	1.09474	0.0	1.00
Zscore: SLTF6	205	-3.76693	1.04441	0.0	1.00
Zscore: SLTF7	205	-2.66309	1.34136	0.0	1.00
Zscore: SLTF8	205	-2.93898	1.28818	0.0	1.00
Zscore: SLTF9	205	-2.61188	1.17212	0.0	1.00
Zscore: SLTF10	205	-2.92117	1.07110	0.0	1.00
Zscore: SLTF11	205	-2.60391	1.28758	0.0	1.00
Zscore: SLTF12	205	-2.56929	1.47583	0.0	1.00
Zscore: TPEF1	205	-3.64392	1.00066	0.0	1.00
Zscore: TPEF2	205	-3.38363	1.16486	0.0	1.00
Zscore: TPEF3	205	-3.26085	1.09403	0.0	1.00
Zscore: TPEF4	205	-3.42097	0.99434	0.0	1.00
Zscore: TPEF5	205	-3.53146	1.07968	0.0	1.00
Zscore: TPEF6	205	-3.97093	1.15958	0.0	1.00
Zscore: TPEF7	205	-4.15665	1.22512	0.0	1.00
Zscore: TPEF8	205	-2.08310	1.51551	0.0	1.00
Zscore: TPEF9	205	-4.00924	1.19124	0.0	1.00
Zscore: TPEF10	205	-3.59933	1.18414	0.0	1.00
Zscore: TPEC1	205	-3.53795	1.25237	0.0	1.00
Zscore: TPEC2	205	-2.76120	1.40100	0.0	1.00
Zscore: TPEC3	205	-2.34273	1.31480	0.0	1.00
Zscore: TPEC4	205	-2.21379	1.28257	0.0	1.00
Zscore: TPEC5	205	-2.54573	1.45186	0.0	1.00
Valid N (listwise)	205				

9.6 Appendix 6 - ANOVA

9.6.1 Age

Table 6.1 - ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
PC	Between Groups	1.826	3	0.609	0.449	0.718
	Within Groups	271.263	200	1.356		
	Total	273.089	203			
TP	Between Groups	3.118	3	1.039	1.779	0.152
	Within Groups	116.858	200	0.584		
	Total	119.976	203			
SL	Between Groups	8.436	3	2.812	2.856	0.038
	Within Groups	196.897	200	0.984		
	Total	205.333	203			

9.6.2 Working on site

Working_At_Different_Locations dummy variable was coded on the below groups. See Table 6.2 – ANOVA below.

Not working at different locations (0)

0 – 0%

10 – 100%

Work at different locations (1)

1 – 10%

2 – 20%

3 – 30%

4 – 40%

5 – 50%

6 – 60%

7 – 70%

8 – 80%

9 – 90%

Table 6.2 - ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
PC	Between Groups	8.261	1	8.261	6.301	0.013
	Within Groups	264.828	202	1.311		
	Total	273.089	203			
TP	Between Groups	0.134	1	0.134	0.225	0.636
	Within Groups	119.842	202	0.593		
	Total	119.976	203			
SL	Between Groups	0.011	1	0.011	0.010	0.919
	Within Groups	205.322	202	1.016		
	Total	205.333	203			