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The impact of working on site on individual motivation of software engineers in a South African organisation

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The impact of working on site on individual motivation of software engineers in a South African organisation

Andrew Gough

A research report submitted to the Faculty of Commerce, Law and Management, University of the Witwatersrand, in partial fulfilment of the requirements for the degree of Master of Business Administration

Johannesburg, 2014

ABSTRACT

South African engineering companies who engage in project execution as part of their core business make use of systems engineers to perform certain project related tasks. Depending on the project phase, it is required that these tasks are completed at the project site, thus requiring the systems engineer to work onsite, away from their homes.

Individual motivation of systems engineers is essential to their organisation, and can have a significant effect on project delivery time, productivity, budgets, absenteeism and project success (Beecham, Baddoo, Hall, Robinson, & Sharp, 2008). It is therefore essential for their employing organisations to strive to maintain a high level of motivation among its systems engineers. Working onsite presents both benefits and challenges to the systems engineers, and this may have an effect on the level of individual motivation of these systems engineers.

The aim of this study was to assess the impact that working onsite has on the individual motivation of systems engineers in a South African engineering organisation. The research was exploratory and was done using a qualitative technique, making use of semi-structured interviews and thematic analysis.

The findings suggest that working onsite has both positive and negative effects on the individual motivation of systems engineers. The findings illustrate the key factors that motivate and de-motivate systems engineers whilst, and due to, working onsite.

The key implication of the research is that it is essential that organisations maximise the motivating factors, whilst reducing or mitigating the de-motivating factors that systems engineers perceive to be present whilst working onsite, in order to increase their levels of motivation, or to maintain a high level of motivation.

DECLARATION

I, Andrew Carl Gough, declare that this research report is my own work except as indicated in the references and acknowledgements. It is submitted in partial fulfilment of the requirements for the degree of Master of Business Administration in the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination in this or any other university.

Andrew Carl Gough

Signed at …….

On the …….. day of ……. 2014

DEDICATION

I dedicate this to my loving wife, Jacqueline Gough, and my two wonderful children, Theodor James and Rowan.

ACKNOWLEDGEMENTS

I wish to thank the following people for their individual contributions:

- My supervisor, Peter Christie, for his support and guidance throughout the whole research;
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TABLE OF CONTENTS

ABSTRACT ..... **II**

DECLARATION ..... **III**

DEDICATION ..... **IV**

ACKNOWLEDGEMENTS ..... **V**

TABLE OF CONTENTS ..... **VI**

LIST OF TABLES ..... **IX**

LIST OF FIGURES ..... **XI**

1. CHAPTER 1: INTRODUCTION **1**

1.1 PURPOSE OF THE STUDY 1
1.2 CONTEXT OF THE STUDY 1
1.3 PROBLEM STATEMENT 3
1.3.1 MAIN PROBLEM 3
1.3.2 SUB-PROBLEMS 3
1.4 SIGNIFICANCE OF THE STUDY 3
1.5 DELIMITATIONS OF THE STUDY 4
1.6 DEFINITION OF TERMS 5
1.7 ASSUMPTIONS 6

2. CHAPTER 2: LITERATURE REVIEW **9**

2.1. INTRODUCTION 9
2.2. BACKGROUND DISCUSSION 10
2.3. WORKING ONSITE 12
2.3.1. EFFECT ON WORK-LIFE BALANCE OF SOFTWARE ENGINEERS 12
2.3.2. EFFECT ON THE NEED FOR PARTICIPATION BY SOFTWARE ENGINEERS 13
2.3.3. EFFECT ON THE NEED FOR AUTONOMY BY SOFTWARE ENGINEERS 14
2.4. INDIVIDUAL MOTIVATION OF SYSTEMS ENGINEERS 15
2.4.1. A LOOK AT SOME PREVIOUS LITERATURE ON MOTIVATION 16
2.4.2. FACTORS MOTIVATING SOFTWARE ENGINEERS TO BE MORE PRODUCTIVE 18
2.4.3. FACTORS DE-MOTIVATING SOFTWARE ENGINEERS 21
2.4.4. VARIOUS MODELS OF MOTIVATION IN SOFTWARE ENGINEERING 23
2.4.5. EFFECTS OF MOTIVATION AND / OR DE-MOTIVATION ON ORGANISATIONS 24
2.5. CONCLUSION OF LITERATURE REVIEW 25

2.5.1. RESEARCH QUESTION....26

3. CHAPTER 3: RESEARCH METHODOLOGY....27

3.1 RESEARCH METHODOLOGY....27
3.2 RESEARCH DESIGN....28
3.3 POPULATION AND SAMPLE....29
3.3.1. CASE SITE AND POPULATION....29
3.3.2. SAMPLE AND SAMPLING METHOD....30
3.4 THE RESEARCH INSTRUMENT....33
3.5 PROCEDURE FOR DATA COLLECTION....34
3.6 DATA ANALYSIS AND INTERPRETATION....34
3.7 LIMITATIONS OF THE STUDY....35
3.8 VALIDITY AND RELIABILITY....36
3.8.1. EXTERNAL VALIDITY....36
3.8.2. INTERNAL VALIDITY....36
3.8.3. RELIABILITY....37

4. CHAPTER 4: PRESENTATION OF RESULTS....38

4.1 INTRODUCTION....38
4.2 DEMOGRAPHIC PROFILE OF RESPONDENTS....38
4.3 RESULTS PERTAINING TO THE RESEARCH PROPOSITION....46
4.4 SUMMARY OF THE RESULTS....52

5. CHAPTER 5: DISCUSSION OF THE RESULTS....53

5.1 INTRODUCTION....53
5.2 DEMOGRAPHIC PROFILE OF RESPONDENTS....53
5.3 DISCUSSION PERTAINING TO THE RESEARCH QUESTION....55
5.5 CONCLUSION....76

6. CHAPTER 6: CONCLUSIONS AND RECOMMENDATIONS 78

6.1 INTRODUCTION....78
6.2 CONCLUSIONS OF THE STUDY....78
6.3 RECOMMENDATIONS....80
6.4 SUGGESTIONS FOR FURTHER RESEARCH....80

REFERENCES....82

APPENDIX A....85

ACTUAL RESEARCH INSTRUMENT.....85

APPENDIX B 89

CONSISTENCY MATRIX.....89

APPENDIX C 93

APPENDIX D 101

APPENDIX E..... 106

LIST OF TABLES

Table 1: Factors of motivation, Beecham et al. (2008).....20

Table 2: Intrinsic motivating factors of software engineering, Beecham et al. (2008).....21

Table 3: Factors of de-Motivation of software engineers, Beecham et al. (2008).....22

Table 4: Various models depicting the motivation of Software Engineers, Sharp et al. (2009) 23

Table 5: Profile of respondents.....32

Table 6: Positive aspects of working onsite.....56

Table 7: Negative aspects of working onsite.....58

Table 8: Aspects that positively affect levels of motivation.....62

Table 9: Aspects that negatively affect levels of motivation.....65

Table 10: Consistency Matrix.....90

Table 11: Full list of positive aspects of working onsite 93

Table 12: Full list of negative aspects of working onsite 95

Table 13: Full list of aspects and factors that positively influence levels of motivation.....97

Table 14: Full list of aspects and factors that negatively influence levels of motivation.....99

Table 15: Comparison of motivational factors as identified in literature to those identified through the research.....102

Table 16: Comparison of intrinsic motivational factors as identified in literature to those identified through the research 104

Table 17: Comparison of de-motivational factors as identified in literature to those identified through the research.....105

Table 18: Revised factors of motivation including the positive aspects of working onsite.....107

Table 19: Revised factors of intrinsic motivation including the positive aspects of working onsite 108

Table 20: Revised factors of de-motivation including the negative aspects of working onsite 109

LIST OF FIGURES

Figure 1: The enhanced MOCC model of motivation in software engineering, Sharp et al. (2009) 24

Figure 2: Current position held 39

Figure 3: Duration of current position held 40

Figure 4: Previous position held 40

Figure 5: Duration of previous position held 41

Figure 6: Duration of employment in current organisation 41

Figure 7: Age of respondents 42

Figure 8: Marital status of respondents 43

Figure 9: Gender of respondents 43

Figure 10: Longest duration of time spent onsite 44

Figure 11: Second longest duration of time spent onsite 45

Figure 12: Average frequency of coming home whilst onsite 45

Figure 13: Positive aspects of working onsite 47

Figure 14: Negative aspects of working onsite 48

Figure 15: Does the level of motivation of systems engineers increase or decrease whilst onsite as compared to in the office? 49

Figure 16: Aspects that positively affected levels of motivation 50

Figure 17: Aspects that negatively affected levels of motivation 51

1. CHAPTER 1: INTRODUCTION

1.1 Purpose of the study

The purpose of this research is to determine what impact working onsite has on the level of individual motivation of systems engineers in a South African engineering company.

The research approach will entail the review of existing literature on each of the individual areas pertinent to this research. This will be followed by individual interviews with a number of systems engineers currently employed at a South African engineering company in order to share their experiences, which will then be contextualised in terms of the literature to address the research proposition.

1.2 Context of the study

In this section, the report provides the context of the study, which is the levels of individual motivation of systems engineers, working at a South African electrical engineering company, performing duties onsite, whilst in the process of project execution.

Successful project execution is critical to the profitability and long-term sustainability for project based engineering companies. According to J. R. Adams and Barnd (1983) as well as King and Cleland (1988), cited by Pinto and Prescott (1988), project execution is one of the four stages in the project life cycle. This is the stage where the actual work of the project is performed, where materials and resources are procured and transformed into the intended project result, (Pinto & Prescott, 1988). It involves various activities, including numerous types of on-site work that needs to be performed by the engineering company.

Onsite typically refers to the site or place where the construction or erection activities of the project are being carried out. The actual project can vary in terms of size and complexity, but for the purposes of this study, only duration of project in terms of time spent onsite by systems engineers are of any significance.

The company considered for this research was ABB South Africa. ABB South Africa is a South African engineering company, which provides products and services to, and performs projects in, the South and sub-Saharan African market. As part of their core business, ABB South Africa performs projects that require systems engineers to work onsite, including control and automation projects, upon which this case will focus.

There are various other companies in South Africa who perform similar control and automation projects, and operate on a very similar basis to ABB South Africa with regards to performing these types of projects. Therefore, ABB South Africa is a suitable representative of this group of companies, and therefore the results of this study, although performed solely on ABB South Africa, can safely be expanded to apply to these companies as well.

For an engineering company, the onsite activities that are of the longest duration are erection and the commissioning period. Human resources are required for these activities, which could require that a significant time is spent onsite. This usually entails that personnel are away from the office and home for a period of time, and typically only go home after a specified number of weeks, depending on the circumstances.

Should the levels of motivation of systems engineers be negatively affected by working onsite, it may expose the project to certain risks such as reduced performance and in the worst case, potentially losing key personnel in the middle of the project, thereby also causing harm to the company both in the short- and long-term.

Therefore, the context of the report includes the levels of individual motivation of systems engineers, working at a South African electrical engineering company, performing duties onsite, whilst in the process of project execution.

1.3 Problem statement

1.3.1 Main problem

The main question that this research attempted to answer was:

What impact does working onsite have on the level of individual motivation of systems engineers in a South African engineering environment?

This question consisted of two main themes, which are:

- Working onsite
- Individual motivation

Finally, the relationship between these two themes, and the effect on each other, formed the crux of the research.

1.3.2 Sub-problems

There are two sub-problems entailed in this research.

The first sub-problem was to identify the positive and negative aspects of working onsite as perceived by systems engineers.

The second sub-problem was to consider the various factors that influence the individual motivation both positively and negatively of system engineers that are present whilst, and due to, working onsite.

1.4 Significance of the study

This study is of significance to a number of people in various roles in the organisation, for numerous reasons.

The research provides a foundation for further research that will provide information on the effect that working onsite has on the individual motivation of systems engineers who are required to work onsite for project purposes.

The research will provide clarity to HR and Business Managers in terms of how working onsite may influence the individual motivation of the systems engineers that they employ and assign to different projects, which depend on each project situation and requirements. This will also provide guidance to HR Managers, and similar interested parties, in creating and implementing policies which emphasise the positive motivational aspects, whilst minimising or avoiding the negative motivational aspects.

Therefore, this study is of significance to various people of different roles in the organisation.

1.5 Delimitations of the study

There are a number of delimitations of this study, of which cognisance was taken when considering the literature, analysing the results and addressing the research proposition.

- This research was limited to systems engineers that are currently working in a South African electrical engineering company, that is currently engaged in the execution of automation and control projects

- Only automation and control projects that require systems engineers to work onsite for a period of time longer than one month, and to be onsite full time for periods no less than one working week, were considered in this research

- Only automation and control projects that require system engineers to work onsite at a site far enough away from the company's physical location to be considered isolated from the office, and far enough away from the systems engineer's place of residence in order to require that the systems engineer makes use of lodging and accommodation other than their place of residence, were considered. For this research, a base figure of 250kms was used

- This research was limited to systems engineers who meet certain specific criteria, and thus would be part of a unique group. The criteria are:
    - Married / In a long term relationship / Divorced
    - Between 30 and 47 years of age

These delimitations provided the boundaries in which the study operated, and were considered when analysing the results and addressing the research proposition.

1.6 Definition of terms

There are various terms which are used in, and are pertinent to, the research, which need to be presented and defined in order to establish a common understanding whilst considering the report.

Project execution - Project execution is one of the four stages in the project life cycle. This is stage where the actual work of the project is performed, where materials and resources are procured and transformed into the intended project result, (Pinto & Prescott, 1988).

Project commissioning - Commissioning is usually the final step of the project, and is carried out according to the set of commissioning procedures which are used to test the entire system and get it ready for start-up. Commissioning is very important from a quality aspect, as it checks and verifies the entire system is correct from the design aspect, according to Plummer Jr (2007).

Software engineering - “The development of possibly large systems intended for use in production environments, over a possibly long period, worked on by possibly many people, and possibly undergoing many changes”, Meyer (2001).

System engineering - “Systems engineering is an interdisciplinary approach and means to enable the realization of successful systems. It focuses on defining customer needs and required functionality early in the development cycle, documenting requirements, then proceeding with design synthesis and system validation while considering the complete problem: operations performance, test, manufacturing, cost and schedule, training and support and disposal.”, Abran, Moore, Bourque, Dupuis, and Tripp (2004).

Systems engineer – For the purposes of this study, a systems engineer is defined as a person who does **system engineering** on a control and automation project for an electrical engineering company.

Project engineer – In the company researched, the title or position of Project Engineer is given to a person who does **system engineering** on a control and automation project for an electrical engineering company. This is the same as a **systems engineer.**

Onsite – For the purposes of this study, onsite refers to a site where a project is being executed which is of a sufficient distance away from the company in order to be sufficiently isolated from the office, and of a sufficient distance from the systems engineer’s place of residence to ensure that the systems engineer stayed in lodging and accommodation away from home for a period more than one week. For this research, a base figure of 250kms was used.

These terms are used in, and pertinent to, the research, and are identified and defined in order to establish a common understanding whilst considering the report.

1.7 Assumptions

There are certain assumptions regarding the research aspect which needed to be made that may affect the viability and reliability of the research, and the outcome of the research.

- There were sufficient quantities of systems engineers that have the relevant experience in order to provide sufficiently rich information for the research purposes.

  This was a reasonable assumption in that there are a large number of systems engineers currently employed at the company. This is due to projects being the core business of the company, and thus these resources are required. Also, there are a large number of systems engineers from all walks of life that are currently, or who have been, employed to work onsite.

- There were a sufficient number of systems engineers within the target group in order to provide a diverse wealth of experience and opinions.

  This was a reasonable assumption in that there are a large number of engineers currently employed in the company, and thus this group should be well represented.

- Respondents answered truthfully as to their levels of individual motivation and the positive and negative effects of working onsite.

  This may have presented a problem, as the engineers might have feared that there may be consequences from divulging such information. However, confidentiality was guaranteed, as well as assurance given from top management that the research had their full support, and encouraged the respondents to answer truthfully.

- The company that employs the systems engineers that were interviewed would be amicable to the interviews, and would find the results of the research to be beneficial.

  This was a reasonable assumption in that the information gleaned from the results and conclusion of the research will be valuable to this company in ways as discussed above. The research was sensitive to this due to the fact that should the company not allow this, or provide access to their employees, it would severely impact the respondents available for interview and subsequently the validity of the research.

The assumptions regarding the research aspect are listed above, and could have affected the viability and reliability of the research, and the outcome of the research.

2. CHAPTER 2: LITERATURE REVIEW

2.1. Introduction

The literature review was based around the two major themes, namely working onsite, and individual motivation.

The first section consists of a study of various literatures which discuss the effects of working onsite. As our study explored the concept of the effect of onsite on the levels of motivation, background was required in order to provide a foundation of what is already known on how this may affect motivation. As suggested by the literature, the three main factors which result from working onsite which directly relate to the factors which influence motivation identified in the first section are looked more closely. These factors included work-life balance, non-participation, and autonomy, and not all three factors are detrimental to motivation levels.

The second section was based upon the concept of motivation, and is essential for this study as the concept of motivation is central to this study, and provides the foundation of what motivation is, what affects it, and why it is important for organisations to know. We start with a look at what motivation is, and why it is important to organisations, which will be followed by a brief history of the theory of motivation over the last 80 years. Then we looked at what various literature suggests are the main factors that influence motivation in general, and software engineers in particular, followed by the main factors that influence or cause de-motivation. From these factors, various models were presented which have been suggested and accepted by various authors showing the relationship between the factors and outcomes. Finally, the effects and external signs of motivation and de-motivation were discussed.

These two themes formed the crux of the literature review, and will be presented in the relevant sections below.

2.2. Background discussion

The background of the research is important to the context of the report, and the main aspects of the background will be presented and discussed.

Engineering companies rely on the successful execution of projects which they manage in order to generate revenue. A project can be defined as “A temporary effort to achieve a set of objectives within time and cost constraints. The project ends when the objective(s) are met or when the powers-that-be decide to end it”, Pitagorsky (1996).

These projects consist of various stages which form part of the whole project life cycle. According to Plummer Jr (2007), projects consist of various phases, namely: Evaluation and definition; Engineering and procurement; Manufacturing; Construction; and Commissioning and start-up. Commissioning is usually the final step of the project, and is carried out according to the set of commissioning procedures which are used to test the entire system and get it ready for start-up. Commissioning is very important from a quality aspect, as it checks and verifies the entire system is correct from the design aspect.

The context of this study will be the commissioning and onsite activities performed by systems engineers, who are part of a branch of software engineering. Baber (1991) states that a software engineer “must thoroughly understand the theoretical foundation of his field and be able to apply it to problems arising in practice”, where software engineering, as cited by Meyer (2001), states that there is a separation of software engineering from programming due to its use in industry, giving another definition “the development of possibly large systems intended for use in production environments, over a possibly long period, worked on by possibly many people, and possibly undergoing many changes”. Abran et al. (2004) states that the IEEE Computer Society defines software engineering as “The application of a systematic, disciplined, quantifiable approach to the development, operation, and maintenance of software; that is, the application of engineering to software”, and further states that systems engineering “integrates all the disciplines and specialty groups into a team effort forming a structured

development process that proceeds from concept to production to operation. Systems engineering considers both the business and the technical needs of all customers with the goal of providing a quality product that meets user needs". According to the International Council on Systems Engineering (INCOSE), as cited again in Abran et al. (2004), "Systems Engineering is an interdisciplinary approach and means to enable the realization of successful systems. It focuses on defining customer needs and required functionality early in the development cycle, documenting requirements, and then proceeding with design synthesis and system validation while considering the complete problem: operations performance, test, manufacturing, cost and schedule, training and support and disposal."

Therefore, the literature was based around software engineers, whilst the research was done on systems engineers. This is due to two reasons, firstly, the proliferation of available literature on software engineers and the lack of suitable literature on systems engineers. Secondly, this is due to the similarity between systems and software engineers as described above, with the more popular term of software engineer being used more widely, which therefore entails that the literature on software engineers can safely be applied to systems engineers. The use of the term software engineers in the title, as opposed to systems engineers, is due to the similarity between the terms as discussed above, and also attempting to remain true to the letter of the research literature, upon which the research is based strongly upon.

It is widely accepted in the industry that the commissioning activity can vary in duration, depending on the size and complexity of the project, and can typically vary from a week to a number of months. This may require that the relevant systems engineer spends many days at a time away onsite. The time spent away onsite will be central concept upon which this research was based.

The aspects of the background of the research have been presented and discussed in order to provide sufficient context to the report.

2.3. Working onsite

The first theme on which the literature was based is working onsite, and the relevant literature on this broad theme will be presented and discussed. This theme was further broken down into three aspects, which formed the basis upon which the relevant literature was reviewed.

Working on a project site, as detailed above, requires engineers to spend time away onsite for varying periods of time. These absences cause a number of effects which influence the level of motivation by, in turn, having an influence on the factors that motivate or de-motivate the engineers, or create situations that are not preferred by software engineers, considering the general characteristics of the software engineers.

2.3.1. Effect on Work-Life Balance of software engineers

Working on a project site doing commissioning work may affect the work-life balance of the engineer, which is one of the motivating factors identified by Beecham et al. (2008) and A César C França and da Silva (2010).

Further to this, Kofodimos (1993) as cited in Lambert, Marler, and Gueutal (2008), states that a lack of balance in one's life is related to higher stress, less life satisfaction, and lower work effectiveness. Galinsky, Bond, and Friedman (1993), also cited in Lambert et al. (2008) say that a large percentage (30%) of employees are willing to reduce pay or even change employers in order to achieve better work–family balance.

According to Michel, Mitchelson, Kotrba, LeBreton, and Baltes (2009), who have done a meta-analysis of previous work-family conflict research, there are two aspects of work-family conflict, namely the Work Interference with Family (WIF) which are factors regarding the work situation that influences the satisfaction of family life, and the Family Interference with Work (FIW), which are factors in the family situation which influence the satisfaction of work life. In this regard, we focused on the Work Interference with Family (WIF) aspect. Michel et al. (2009) have examined and compared existing work-family conflict

models, and have developed a new model which incorporates all the current work-family theory and research. Their research suggests that work time demands are a primary predictor of WIF, but interestingly not a predictor of job satisfaction.

Further to this, McNamara, Pitt-Catsouphes, Matz-Costa, Brown, and Valcour (2013) suggest that there is an inverse relationship between hours worked and satisfaction with work-life balance. In their study, it also suggests that there are external factors which can moderate this relationship, the main one being the current level of satisfaction with work-life balance. Therefore, if one currently has a higher level of satisfaction, then the longer hours worked will have a lesser effect on reducing the level of satisfaction than someone who is currently experiencing a lower level of satisfaction. However, the studies suggest that the relationship still remains true in that longer working hours reduce the level of satisfaction of work-life balance.

2.3.2. Effect on the need for participation by software engineers

Due to the activities of the engineer, the engineer might be away onsite for varying periods of time. This creates issues that affect the levels of motivation of the systems engineer.

As stated by Beecham et al. (2008) above, a sense of belonging/supportive relationships and employee participation/involvement/working with others are motivating factors for software engineers. They also have certain characteristics, as stated above, one of which being the need to be sociable/identify with group/organisation/supportive relationships. They go on to state the factors that cause de-motivation of software engineers, one of which is poor working environment (e.g. wrong staffing levels/unstable/insecure/lacking in investment and resources; being physically separated from team).

Kurkland and Bailey (1999) have discussed the benefits and challenges of telecommuting on various groups of people, one of which is the mobile worker, who they have defined as employees who are frequently on the road, and thus do not spend much time in the traditional office. This definition is similar to

Crawford, MacCalman, and Jackson (2011), who state that “Remote and mobile workers (RMWs) are individuals who spend the majority of their working time away from a home or work base”.

This is similar to the systems engineers during the commissioning activities in that both are not present at the office often and for long periods, therefore the disadvantages experienced by the mobile worker in this context will be similar to that of the systems engineer during commissioning.

According to Kurkland and Bailey (1999), and echoed by Crawford et al. (2011), some the challenges experienced that are of value to this report are:

1. Social isolation
2. Professional Isolation
3. Access to resources

These challenges directly influence the motivating and de-motivating factors, as well as characteristic traits of software engineers, identified above.

2.3.3. Effect on the need for autonomy by software engineers

A common motivating factor of software engineers suggested by Beecham et al. (2008) and A César C França and da Silva (2010), is autonomy (e.g. freedom to carry out tasks, allowing roles to evolve). Similarly, the need for autonomy has been suggested as one of the traits of software engineers by Beecham et al. (2008).

Autonomy is seen as one of the advantages of remote and mobile working by Kurkland and Bailey (1999) and Crawford et al. (2011). Therefore, given the similarities in this context between the software engineers and remote and mobile working, the advantage of autonomy is seen as both a motivating factor to software engineers, as well addressing one of the characteristic traits of software engineers.

The literature reviewed was based around the broad theme of working onsite, which was further broken down into three aspects. These three aspects further formed the basis upon which the relevant literature was reviewed and presented.

2.4. Individual Motivation of Systems Engineers

The second theme on which the literature was based is the individual motivation of systems engineers, and the relevant literature on this broad theme is presented and discussed. Firstly, some of the previous literature on motivation, starting from around 1911 to the present, is presented, followed by literature on the factors which motivate software engineers to be more productive, which are broken into two aspects, namely extrinsic and intrinsic factors. Literature on the factors which de-motivate software engineers is then presented, which is followed by a presentation of literature which proposes various models that attempt to depict the levels of motivation of software engineers. Finally, literature on the effects of motivation and de-motivation on organisations is presented.

The concept of motivation is very important to all organisations. McConnell (1998), as cited in Beecham et al. (2008), stated that ‘‘Motivation is a soft factor: It is difficult to quantify, and it often takes a back seat to other factors that might be less important but are easier to measure. Every organisation knows that motivation is important, but only a few organisations do anything about it. Many common management practices are pennywise and pound-foolish, trading huge losses in motivation and morale for minor methodology improvements or dubious budget savings.’’

Motivation is also important in terms of individual performance, as (J Richard Hackman (1987)) put it, as cited in A. César C. França, da Silva, Felix, and Carneiro (2013), and is the effort that an individual puts into a task, depends on motivation, and when an individual is more satisfied through factors such as the organisational context and the design of tasks, they are more willing to put more effort into the job, which thus increases performance.

Further to this, Boehm (1981), as cited in Beecham et al. (2008), states that motivation in software engineers has the largest impact in terms of their productivity, and DeMarco and Lister (1999), as cited by Beecham et al. (2008), found that one of the most frequent causes of software development project failure is due to motivation.

2.4.1. A look at some previous literature on motivation

Previous literature on the more common concepts and thinking on motivation of individuals in both a personal capacity and in an organisational context, starting from around 1911 to the present, is presented. This is done in an effort to provide an understanding of the concept of motivation of individuals, to illustrate how the understanding of how individual motivation is affected has developed to the present views, and how the presently accepted factors of motivation are influenced by, and originated from, these earlier concepts and thinking.

According to Taylor (1911) as cited in Latham and Ernst (2006) in their literature review, in the first two decades of the twentieth century, it was believed that money was the primary source of motivation. After this, other needs became apparent, such as job recognition and status, Viteles (1932), cited in Latham and Ernst (2006). This seemed to introduce the concept of basic needs, Maslow (1943), which exist as a hierarchy, and as the lower ones are met, thus the next, higher level need is pursued. This was further pursued by Porter (1961), Porter (1962), Lyman W Porter (1963a), Lyman W. Porter (1963) and Lyman W Porter (1963b) in his studies, as cited in Latham and Ernst (2006), where he showed that a similar approach was taken by employees, where the lower employees tended to look after their lower order needs, such as job security, and only progressed towards higher order jobs and higher order needs when the lower order needs were satisfied.

Then Herzberg, Mausner, and Snyderman (1959), cited in Latham and Ernst (2006), suggested that situational factors also played an important role in motivation, which affected the growth of an employee. This formed what was to be known as the job enrichment or two-factor theory. This brought job

characteristics and situations into the fray, where Herzberg concluded that certain factors would contribute to both job satisfaction and dissatisfaction.

A study done by B.F. Skinner, as discussed by Nord (1969), who maintained that Skinner's work was not recognised to the deserved extent, suggested that employees respond to both positive reinforcement and the consequences of punishment, which guide their behaviour. This is similar to the Herzberg theory in that a person's behaviour can be modified by someone else.

Vroom (1964), as cited in Latham and Ernst (2006), introduced the expectancy theory, which predicts the three aspects which determine motivation, namely a person's choice, effort and persistence. Essentially, the theory states that a person will engage in a certain behaviour based upon three aspects, namely that their effort will lead to performance, that their performance will lead to certain outcomes, and that these outcomes are valued by the person.

Equity theory was developed by J. S. Adams (1963), as cited in Latham and Ernst (2006). Equity theory is based on the evaluation of a person's efforts compared with the perceived outcome, and is also relative to a comparison of others.

The Job Characteristics Model, developed by J. Richard Hackman and Oldham (1976), states that the five core job dimensions of Skill Variety, Task Identity, Task significance, Autonomy and Feedback, determine a person's critical psychological states, namely the Experienced Meaningfulness of one's work, Experienced Responsibility for work outcomes, and the degree to which the person has Knowledge of the results of their work. This, in turn, then determines the personal and work outcomes of the individual.

As we move to the more recent motivational literature, it becomes apparent that both the basic needs concept, as well as situational factors, is accepted. According to Latham and Pinder (2005), a framework can be provided, which was adapted from Locke and Henne (1986), and essentially takes three main aspects of the individual, namely the needs, personality traits and values; the context (national culture, job design, and person-context fit); and cognition, including affective reactions which are reciprocally related.

As we look at the individual components of the above three aspects, and according to Latham and Pinder (2005), the needs-based theories explain why a person will or must act. However, they do not explain what outcome a person will choose and why in any specific situation, and do not take individual choices into account. When considering the personality traits, Latham and Pinder (2005) have suggested that personality traits play an important role in understanding and influencing choice and performance, as well as suggesting that job characteristics also play a role.

Similar to needs, values play an important role in driving and sustaining behaviour, Latham and Pinder (2005). However values tend to be more subconscious, and are obtained through experience and purpose. In terms of the whole concept of context, Latham and Pinder (2005) conclude that context does play an important role in determining motivation, as well as the person-context fit. Therefore if a person's values and goals are matched by the organisation, this suggests an increase in work motivation. Finally, looking at cognition, Locke and Henne (1986), as cited in Latham and Pinder (2005) observed that "cognition is inherent in motivation", and that based upon needs, values, the situational context, and their developed assumptions and identities of themselves, people choose and set goals, and find ways in which to attain them.

This section presented some of the previous literature, starting from around 1911 to the present, on the more common concepts and thinking on motivation of individuals in a personal capacity and in an organisational context.

2.4.2. Factors motivating software engineers to be more productive

Literature on the factors that motivate software engineers to be more productive is presented below. These include both the extrinsic and intrinsic factors of motivation which have been identified and presented by the relevant literature.

Herzberg et al. (1959), as cited in Sharp, Baddoo, Beecham, Hall, and Robinson (2009) state that there are two main forms or types of motivators,

namely intrinsic, which come from the reward of performing the task or job itself, and extrinsic, which are factors external to the task or job.

In the context of this research, the engineers required to do the commissioning activities will be systems engineers. Beecham et al. (2008) did a systematic literature review on motivation in software engineering and identified a number of factors. As stated in numerous articles that were seen as motivators and de-motivators by software engineers. As defined above, systems engineers can be considered similar to software engineers, and thus was regarded as close enough in terms of motivation in the context of this research to be able to use the factors as provided below. Therefore these lists were the basis upon which to compare and analyse the results found in the research later on. The factors are as follows:

Table 1: Factors of motivation, Beecham et al. (2008)

Rewards and incentives (e.g. scope for increased pay and benefits linked to performance)
Development needs addressed (e.g. training opportunities to widen skills; opportunity to specialise)
Variety of work (e.g. making good use of skills, being stretched
Career path (opportunity for advancement, promotion prospect, career planning)
Empowerment/responsibility (where responsibility is assigned to the person not the task)
Good management (senior management support, team-building, good communication)
Sense of belonging/supportive relationships
Work/life balance (flexibility in work times, caring manager/employer, work location)
Working in successful company (e.g. financially stable)
Employee participation/involvement/working with others
Feedback
Recognition (for a high quality, good job done based on objective criteria – different to No 1 which is about making sure that there are rewards available)
Equity
Trust/respect
Technically challenging work
Job security/stable environment
Identify with the task (clear goals, personal interest, know purpose of task, how it fits in with whole, job satisfaction; producing identifiable piece of quality work)
Autonomy (e.g. freedom to carry out tasks, allowing roles to evolve)
Appropriate working conditions/environment/good equipment/ tools/physical space/quiet
Making a contribution/task significance (degree to which the job has a substantial impact on the lives or work of other people)
Sufficient resources

However, software engineering in itself tends to provide motivation, as software engineers find certain aspects of software engineering to be motivating (Beecham et al., 2008). These would be a form of intrinsic motivators, and would include:

Table 2: Intrinsic motivating factors of software engineering, Beecham et al. (2008)

Problem solving (the process of understanding and solving a problem in programming terms)
Team working
Change
Challenge (Software Engineering is a challenging profession and that in itself is motivating)
Benefit (creating something to benefit others or enhances well-being) [
Science (making observations, identifying, describing, engineering, investigating and theorising, explaining a phenomena)
Experiment (trying something new, experimentation to gain experience
Development practices (Object Oriented, XP and prototyping practices)
Lifecycle – software development, project initiation and feasibility studies, *maintenance (*also found a de-motivating activity)

The literature presented on the factors that motivate software engineers to be more productive was presented above, which included both the extrinsic and intrinsic factors of motivation.

2.4.3. Factors de-motivating software engineers

In terms of this research, the factors that cause de-motivation are also important in order to try and identify whether the requirement for working onsite are listed or form part of the established de-motivators, and thus the relevant literature which suggest these factors will be presented.

There are also factors which contribute towards the demotivation of software engineers. According to Beecham et al. (2008), these include:

Table 3: Factors of de-Motivation of software engineers, Beecham et al. (2008)

Risk
Stress
Inequity (e.g. recognition based on management intuition or personal preference)
Interesting work going to other parties (e.g. outsourcing)
Unfair reward system (e.g. management rewarded for organisational performance; company benefits based on company rank not merit)
Lack of promotion opportunities/stagnation/career plateau/boring work/poor job-fit
Poor communication (feedback deficiency/loss of direct contact with all levels of management)
Uncompetitive pay/poor pay/unpaid overtime
Unrealistic goals/phoney deadlines
Bad relationship with users and colleagues
Poor working environment (e.g. wrong staffing levels/unstable/insecure/lacking in investment and resources; being physically separated from team)
Poor management (e.g. poorly conducted meetings that are a waste of time)
Producing poor quality software (no sense of accomplishment)
Poor cultural fit/stereotyping/role ambiguity
Lack of influence/not involved in decision making/no voice

Frangos (1998) also names a few factors that contribute to the de-motivation of the software engineer, namely “Lack of office space and engineer concentration, unpaid overtime, non-productive meeting cultures, performance appraisals and absence of team work all contribute to the demotivation of the software engineer”. He goes even further by stating that the human factor is especially important in the labour intensive software development world.

Literature which suggests factors that cause de-motivation have been presented, which are also important in order to try and identify whether the requirement for working onsite are listed or form part of the established de-motivators.

2.4.4. Various models of motivation in software engineering

Literature from authors that suggest various models of motivation of software engineers is presented, as well as listing various models developed. Finally, one model of motivation of software engineers is presented.

There are numerous models used by numerous authors that try to depict the motivation of software engineers which have been part of numerous studies, most of which are disparate and disjointed, Sharp et al. (2009). These models can be summarised below:

Table 4: Various models depicting the motivation of Software Engineers, Sharp et al. (2009)

Job characteristics model (JCM) of software engineer (SE) motivation (development, enhancement or validation)
Models focusing on software engineer job satisfaction
Models of open source developer SE motivation
Models of leadership influence on SE motivation
Model drawing on expectancy theory, goal-setting theory, and organisational behaviour specific to the software development process
Model of task design influence on SE motivation
Model of career progression influence on SE motivation
Social support influence on software engineer turnover

However, Sharp et al. (2009) have created a model, called the MOCC (Motivators, Outcomes, Characteristics and Context) model, which was based upon empirical research of literature, and compared to various models available to try and enhance them. Although, this model has not been tested empirically thus far, A. César C. França et al. (2013), it seems to incorporate most of the relevant aspects and is presented below:

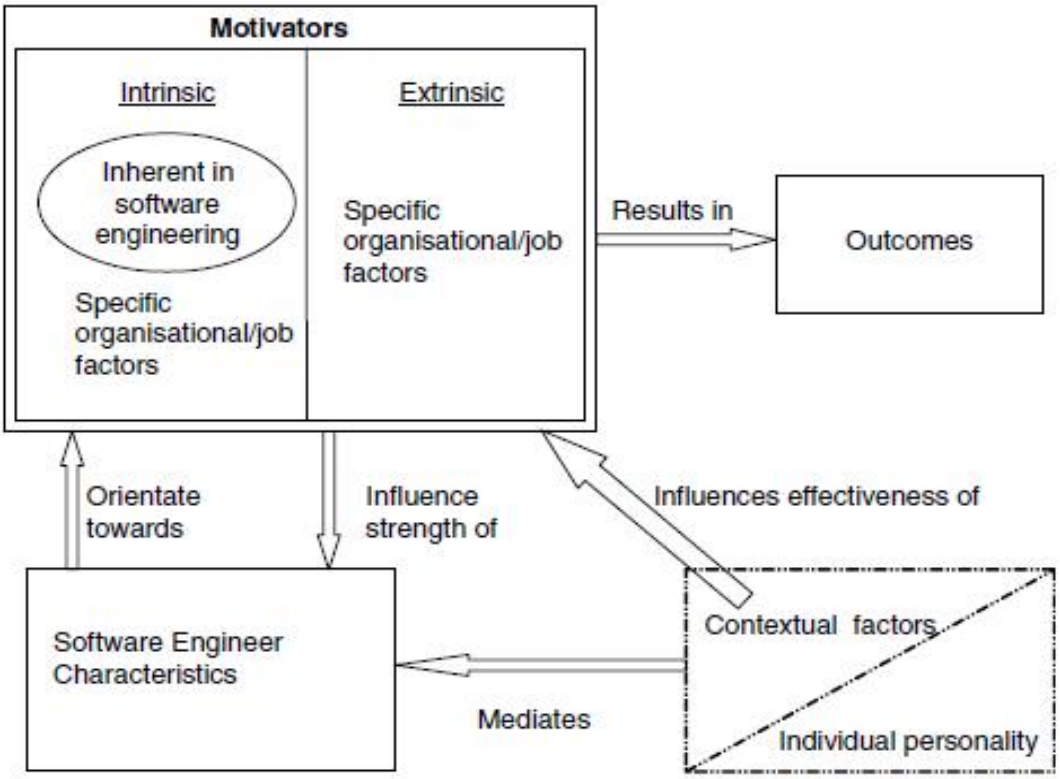


Figure 1: The enhanced MOCC model of motivation in software engineering, Sharp et al. (2009)

Literature from authors that suggest various models of motivation of software engineers was presented, as well as listing various models developed. This culminated in a presentation of one model of motivation of software engineers.

2.4.5. Effects of motivation and / or de-motivation on organisations

Motivation and / or de-motivation have certain effects on organisations, which make this research significant to organisations, and thus literature on these effects is presented, as well as listing these effects.

According to A. César C. França et al. (2013), there were advantages that accrued due to the motivation of the engineers, and also disadvantages due to the de-motivation of engineers. Organisational attractiveness was increased due to the factors present that increased the level of motivation of the engineers, namely task significance, job stability and the opportunity to learn.

This increased the desire of individuals to join and stay with the company. Interestingly, employees with low levels of motivation reported an intention to leave, which directly related to either frustrated growth, or better career opportunities elsewhere. However, the study also suggested that the voluntary turnover does not have a direct link to the levels of motivation, but is moderated by other external factors.

Beecham et al. (2008) stated that the majority of literature reviewed in their study suggested that retention is a major outcome of motivated or de-motivated engineers. Other external signs include: Project delivery time; Productivity; Budgets; Absenteeism; and Project Success.

Literature on the effects of motivation and / or de-motivation on organisations, as well as listing these effects, have been presented, and make this research significant to organisations.

The second theme, on which the literature was based, is the individual motivation of systems engineers, and the relevant literature on this broad theme was presented and discussed. This included a look at some of the previous literature on motivation starting from around 1911 to the present, followed by literature on the factors which motivate software engineers to be more productive. The relevant literature on the factors which de-motivate software engineers was presented, followed by a presentation of literature which proposes various models that attempt to depict the levels of motivation of software engineers. Finally, literature on the effects of motivation and de-motivation on organisations was presented.

2.5. Conclusion of literature review

The literature review was based around the two major themes, namely working onsite and motivation.

Discussion of the concept of working onsite presented three main factors that are as a result of working onsite which relate to and influence the levels of motivation. The literature suggested that work-life balance, non-participation,

and autonomy, would affect the levels of motivation either positively or negatively.

The importance and context of motivation in organisations was presented. Against the history of the concept of motivation, the relevant factors that cause motivation and de-motivation were presented as suggested by the various literature. The various models of the relationships between the factors and outcomes were discussed, culminating in an overall general model, which was suggested by the relevant authors to encompass all the current models and thoughts on motivation, and finally the effects and external signs of motivation levels were discussed.

These two themes formed the crux of the literature review, and were presented in the relevant sections.

2.5.1. Research Question

Having reviewed the literature on working onsite and individual motivation, the literature seems to suggest that working onsite will have an impact of the level of motivation of software engineers.

Therefore, we can formulate a research question to determine what impact working onsite has on the individual levels of motivation of systems engineers.

Thus:

Research Question 1: What impact does working onsite have on the level of individual motivation of systems engineers?

The research will attempt to answer this question through targeted interviews with relevant systems engineers, working in the projects environment which requires them to be working onsite for periods of time.

The following chapter will outline the methodology used in the research, with the presentation and discussion of the results, and appropriate conclusions to follow in subsequent chapters.

3. CHAPTER 3: RESEARCH METHODOLOGY

This chapter outlines the research methodology, research design used, population and sample of the research, the procedure followed and the manner in which data were collected and analysed.

The literature studied on the two sub-problems presented findings and information that could be very general, applying to a variety of organisations, industries, circumstances, technologies and individuals. This research attempted to focus specifically on systems engineers, working in an engineering company in South Africa, and therefore was an exploratory type research.

This research attempted to determine what impact working onsite has on the individual motivation levels of systems engineers working for an engineering company in South Africa. Ten systems engineers working in an engineering company were interviewed, using a semi-structured format with open questions.

3.1 Research methodology

In this section, the research methodology that was used for this research is discussed, as well as other important considerations and qualifications of the research.

The research method was a qualitative study. According to Bryman (2012), qualitative research involves generating a theory from research, and in this research, use was made of data in the form of words that were obtained through the use of interviews with systems engineers in an engineering company in South Africa. This data was then used to form a theory or perspective.

This method is suitable to this research as this research is an exploratory examination of the data obtained through interviews in order to determine the relationship, if any, between working onsite and the levels of motivation of systems engineers.

The research is both idiographic and nomothetic in orientation, in that it is attempting to assess a proposition that provides a general understanding of behaviour of a specific group of people, rather than attempting to answer or prove a specific research question or hypothesis.

The research methodology that was used for this research was discussed in this section, as well as other important considerations and qualifications of the research.

3.2 Research Design

The approach that was adopted for this research and the reasoning behind the use of this approach is discussed in this section, as well as the advantages and disadvantages of this approach.

The methodological approach that was adopted for this research includes the use of semi-structured interviews. According to Bryman (2012), this involves the use of an interview guide which covers fairly specific topics, but allows the interviewee the freedom in terms of how to answer.

This is applicable to this study in that it is an exploratory study, and the opinion and thoughts of the interviewee were required. As we have no distinct questions or hypotheses, the study needs to remain open in order to provide a complete understanding of the concept in order to identify emergent themes.

The main advantage of this method is that it allowed the interviewees to include their opinions and experiences without limiting them to the need to answer the respective question. Secondly, it allowed the introduction of perspectives or information that may not have arisen through the literature, and may be very specific to the research subject, namely South African systems engineers in South African engineering companies. Thirdly, it allowed the interviewer to explain what exactly is required of the interviewee, in terms of elaborating on and explaining the question, and fourthly, it allowed the inclusion of anecdotal evidence into the answer.

The disadvantages included the need for accurately recording the interview. As each answer may be different, varied in length, and include non-verbal aspects, this needed to be recorded accurately and interpreted correctly in order to faithfully reproduce the data required. Secondly, the interviewer needed to ensure that whilst allowing the interviewee freedom to answer as they wish, that the question gets answered satisfactorily.

The approach that was adopted for this research and the reasoning of the use of this approach was discussed in this section, as well as the advantages and disadvantages of this approach.

3.3 Population and sample

3.3.1. Case site and population

The company, and population, that have been chosen for this research is presented and discussed in this section.

The company that has been considered for this research is a South African engineering company, who, as part of their core business, performs projects that require systems engineers to work onsite, and those projects contribute a significant portion to the company's revenue. There are a large number of engineering companies in South Africa that make use of engineers to perform projects, but there are a smaller number of companies that provide project services in the systems engineering field that make use of systems engineers.

The company chosen is ABB South Africa. ABB South Africa was established in 1992, and is based in Longmeadow, Johannesburg. It currently employs around 1,500 employees, and has a strong manufacturing capability in South Africa, with manufacturing sites around the country, ABB (2013). ABB South Africa supplies products and services to, and performs projects in, the South and sub-Saharan African market, which include control and automation projects, upon which this case will focus.

There are various other companies in South Africa who perform similar control and automation projects, and operate on a similar basis to ABB South Africa with regards to performing these types of projects. Therefore, ABB South Africa is a suitable representative of this group companies, and therefore the results of this study, although performed solely on ABB South Africa, can safely be expanded to apply to these companies as well.

The population will be all the employees of ABB South Africa who work in an engineering environment and who perform the various activities as required to successfully execute projects. These include all the engineers in the organisations' employ, who have a wide and diverse demographic profile. However, to the extent of the roles to be performed as per the job requirements, the population is very similar, and thus analogous to the sample chosen.

In this section, the company and population that have been chosen for this research was presented and discussed.

3.3.2. Sample and sampling method

The aim of the design, sample characteristics and number is discussed, as well as the reasoning behind the choice of this sample. Small discrepancies as to titles and limitations of number of respondents in the sample are explained, finishing with a presentation of the respondents profiles.

The aim of the design of the sample is to avoid inaccuracy/bias. Therefore the company that was used in the sample is one of the larger players in terms of manpower and resources. This was done as the larger the company, the larger the number of systems engineers that it employs to work on projects, as well as a larger variety of projects and onsite conditions to which the systems engineers are exposed. This therefore provides a larger pool of engineers that are available for our study.

Due to the large number of, and variety of systems engineers across various age groups, relationship status', career stages, etc. that are working in the projects environment, these systems engineers could be grouped according to

numerous characteristics. Each group would have differing experiences and perspectives to motivation and working onsite, therefore one specific group was chosen upon which to do the study.

The group that was chosen for the purposes of this study were systems engineers that are married and between the ages of 30 and 40. This group chosen due to the author's assumption that factors of a personal or family nature will have the largest effect on systems engineers whilst onsite, and would have the greatest impact on the levels of motivation of the systems engineers within this specific group, due to their marital status and age, than any other group.

The sample used for this research consisted of ten systems engineers that fell within this group, and these ten system engineers were approached and interviewed.

In the company studied, the position of systems engineer does not exist. The position that matches the requirements and job description of a systems engineer is a projects engineer. This is not unique to ABB South Africa, as the title or position of system engineer can be different across similar companies in the industry, but performing the same functions and fulfilling the same job description.

The respondents approached were not limited to the current position or title of projects engineer. Some respondents were at a management level, but were still active in performing the role of a systems engineer in a project execution environment, in addition to their other managerial duties. It was also required that all the respondents had sufficient experience in working onsite as defined above, for the required periods.

During the research, it was found that the sample had to be expanded slightly due to the sample size constraint if the above criteria were maintained. The sample was therefore expanded to include engineers that are in a serious long term relationship, and who are divorced, as well as to include systems engineers up to the age of 47 years.

The author's reasoning for the sample expansion was that the systems engineers in a serious relationship will experience similar motivational forces as those who are married. The ones that are divorced, who were of ages up to 47 years, were instructed in the interview to consider the times they were onsite during the period when they were married, and to consider the questions asked in the context of being married. This allowed the sample size of ten systems engineers to be met.

Permission was given by the CEO of ABB South Africa to interview systems engineers in ABB South Africa's employ, and the instruction given that the interviews would be arranged in conjunction with, and with the assistance of the HR director. Prior to the interviews with the systems engineers, the respondents were called into a meeting with the HR director, where the assurance was given that research has the approval of the company, and the respondents were encouraged to fully cooperate as openly as possible, and the respondents were assured of confidentiality.

The results of the study will be made available to ABB South Africa, for the attention of the HR director, and for dissemination to whomever within the company as seen fit.

The profile of the respondents that were approached were those that fit the above sample criteria and that had sufficient experience with working on a site, as per the definition of onsite given above.

Table 5: Profile of respondents

	Sample Size
Systems Engineer	Eight
Duties include the execution of engineering functions on projects handled by ABB.	
Engineering Manager	
Duties include the managing and leadership of the engineering department, as well as those of a systems engineer	One

Engineering Section Head	
Duties include the managing and leadership of the automation engineering section, as well as those of a systems engineer	One

This section discussed the aim of the design, sample characteristics and number, as well as the reasoning behind the choice of this sample. It also explained small discrepancies as to titles and limitations of number of respondents in the sample, and presented the respondents profiles.

3.4 The research instrument

The choice of interview type and an explanation of the tools used in the interview is discussed in this section, as well as an overview of the research instrument given.

A semi-structured interview was used for the research and use was made of an interview guide. The interview guide is important in order to provide the main points to be covered, but still be flexible enough to allow the interviewee to provide additional information if necessary, Bryman (2012).

The interview guide consisted of two sections, namely a background or introductory section, and a main section which addressed the respective aspects of the research, namely:

1. Working onsite

2. Individual motivation

Each section consisted of a few main points, of which the main purpose was to provide prompts and guidance to the interviewer.

Given the possible time constraints of the interviewees, the questions were limited to eight questions.

An example of the actual research instrument is provided in Appendix A.

This section discussed the choice of interview type and an explanation of the tools used in the interview, as well as providing an overview of the research instrument.

3.5 Procedure for data collection

How the data was collected, and in what form it was gathered is discussed in this section.

The data was collected from the interviews in the form of notes written by the interviewer, and if permission has been granted by the respective interviewee, the interview was recorded.

The notes formed the basis of the data gathered, which consisted of notes taken during the interview. After the interview, the notes were analysed and a thematic analysis done to identify any emerging and dominant themes that arose.

In this section, how the data was collected, and in what form it was gathered was discussed.

3.6 Data analysis and interpretation

This section discusses how the data was analysed, and what approach was used.

Data analysis was in the form of thematic analysis. Bryman (2012) defines thematic analysis as “the term used in connection with the analysis of qualitative data to refer to the extraction of key themes in one’s data. It is a rather diffuse approach with few generally agreed principles for defining core themes in data.”

The Framework approach, as stated in Bryman (2012) was used to identify the core and sub-themes of the data after analysis of the interview notes. Care was taken when inserting the information into the framework, following the guidelines provided as advised by (Ritchie and Lewis (2003)), cited by Bryman (2012).

How the data was analysed, and what approach was used was discussed in this section.

3.7 Limitations of the study

There are various limitations to this study, and these had to be taken cognisance of when analysing the research report. These are identified and discussed in this section.

- Only systems engineers that are currently working in South African electrical engineering companies that are currently engaged in automation and control projects and are required to work onsite for project execution were interviewed
- The respondents approached were all male. Although there are female systems engineers that perform similar roles and functions in the company, they did not meet the required criteria of the respondents
- The exploratory nature of the research has limitations, namely it may not reveal key concepts in the research, would not provide conclusive evidence, and will require subsequent research
- The verification of the data obtained has limitations as it was based upon opinions and experiences of the systems engineers
- A potential weakness existed that due to the open nature of the interview, it required that the interviewee correctly identified and articulated the meaning of the answers provided
- The data analysis could be flawed if the correct themes were incorrectly identified

The various limitations to this study were identified and discussed in this section.

3.8 Validity and reliability

The validity of the research, which comprises external and internal validity, was presented and discussed in this section, as well as how the reliability of the research was maintained.

3.8.1. External validity

Merriam (2009) as cited in A. César C. França et al. (2013) states that it is usually up to the reader to generalise the findings of the study and apply these findings to other situations. However, in this study, it was limited to systems engineers due to the unique characteristics of systems engineers.

However, in order to maximise the external validity, a large company with a large number of systems engineers that engage in a large number, and variety of projects, who are used to work onsite increased the pool of systems engineers that were interviewed, thus providing greater potential diversity of the systems engineers.

3.8.2. Internal validity

Two measures were employed to increase the internal validity of the research. Firstly, there were ten systems engineers interviewed in order to get their opinions. Should there be any findings or themes that seemed to be incongruent with what the others are saying, this would be identified. This is a lesser form of triangulation, which according to Denzin (1970), as cited in Bryman (2012) is “an approach that uses “multiple observers, theoretical perspectives, sources of data and methodologies””.

Secondly, a form of respondent validation, which according to Bryman (2012) is “whereby a researcher provides the people on whom he or she has conducted the research with an account of his or her findings”, was employed in that the generalised results of the research was provided to the companies who participated in the survey.

3.8.3. Reliability

According to A. César C. França et al. (2013) “An important question in qualitative research is whether the findings are consistent with the data collected”. In order to maximise this consistency, the notes taken during the interview, excluding the background information, were kept to allow for investigation and analysis by external reviewers.

In this section, the validity of the research, consisting of external and internal validity was presented and discussed, including how the reliability of the research was maintained.

4. CHAPTER 4: PRESENTATION OF RESULTS

4.1 Introduction

This chapter looks at the demographic profile, and other relevant information pertaining to the respondents interviewed for this research. The profile of the actual group of respondents interviewed will be compared with the original envisaged profile, and the deviation and the reason therefore is discussed.

Included in the relevant respondent information is the duration of working onsite that were experienced by the respondents, as well as the frequency of returning home during the onsite work.

Next, the positive and negative aspects of working onsite as perceived by the respondents is presented, as well as a discussion of how the factors that were perceived by each respondent contributed to the aspects presented.

The aspects that influenced the level of motivation of the respondents, both positively and negatively, that were present onsite, and due to the respondent being onsite, is presented, along with a discussion of how the factors that were perceived by each respondent contributed to the aspects presented.

Finally, the conclusion of the results in context of the research question is provided, as well as how the research has provided the required information to address the research question.

4.2 Demographic profile of respondents

The various demographic profiles of the respondents is presented in this section, as well as other important information pertaining to the experiences of the respondents, which had an effect on this research.

The qualifying criteria of the respondents for this study, were systems engineers that are married and between the ages of 30 and 40. It was initially envisaged to approach and interview ten systems engineers that fall within this group.

However, it was found that there was a sample size constraint if the above criteria were kept to, and therefore the sample had to be expanded slightly. The sample was expanded to include engineers that are in a serious long term relationship, and who are divorced, as well as to include systems engineers up to an age of 47 years.

The full demographic information that is relevant to this study of all the respondents is shown below:

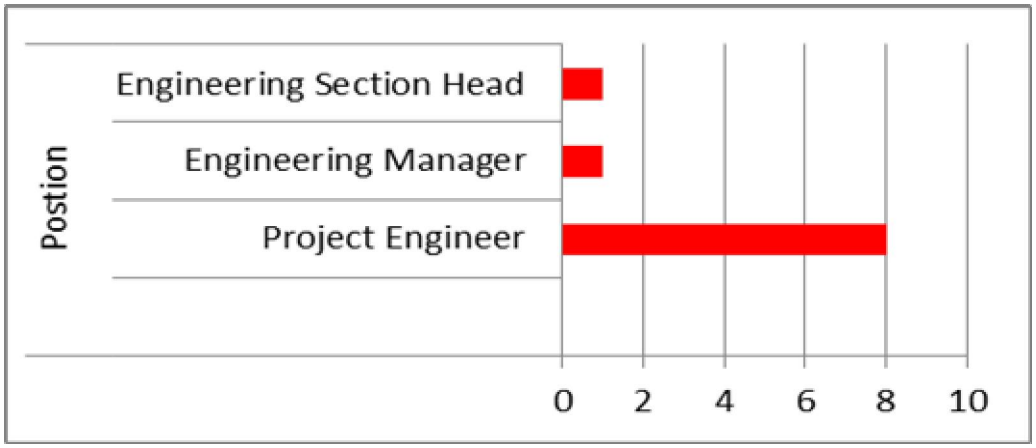


Figure 2: Current position held

The sample consisted of eight projects engineers, one engineering manager and one engineering section head.

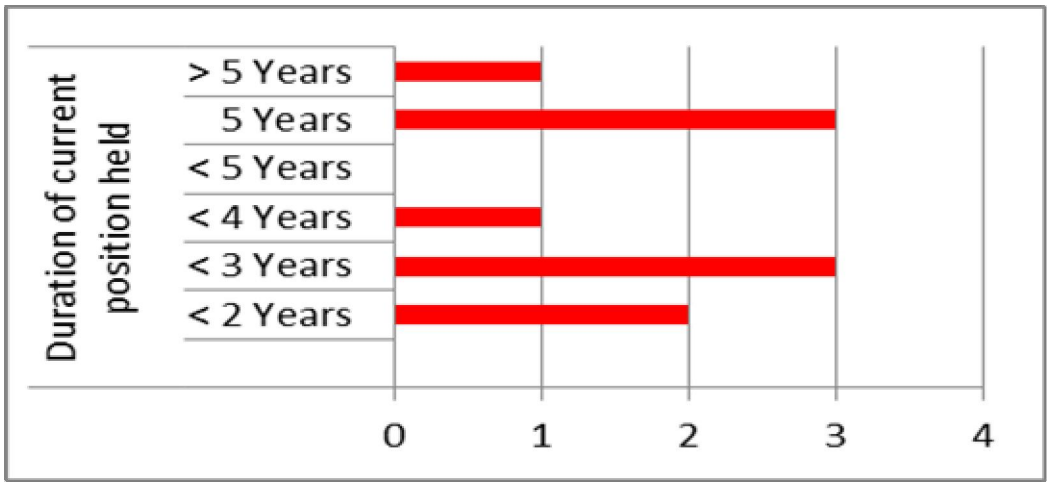


Figure 3: Duration of current position held

Three respondents had been in their current position for three years, another three for five years, whilst two had been in their current position for less than two years. The remaining two had been in their current positions for more than five years and less than four years, respectively.

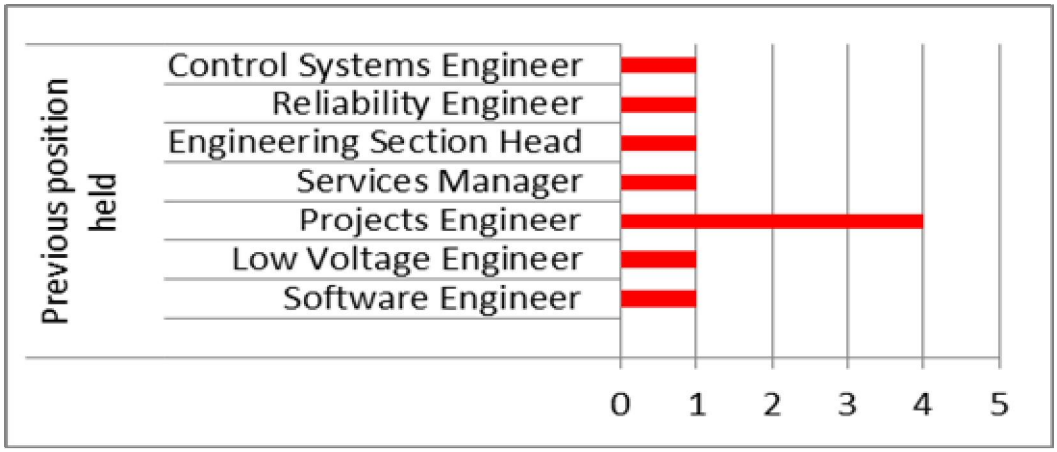


Figure 4: Previous position held

The majority of the respondents (four) had been projects engineers previous to their current position, whilst the rest included positions such as control systems engineer, reliability engineer, engineering section head, services manager, low voltage engineer, and software engineer.

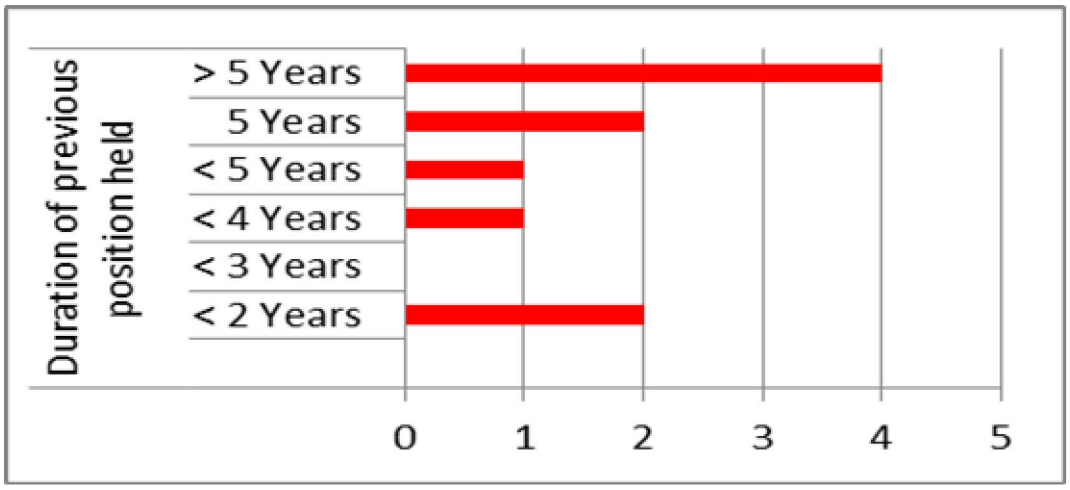


Figure 5: Duration of previous position held

The longest duration of the previous position held was more than five years, held by four respondents. Two had been in their previous position for less than two years, whilst another two were five years. Two respondents had less than four years, and less than five years respectively.

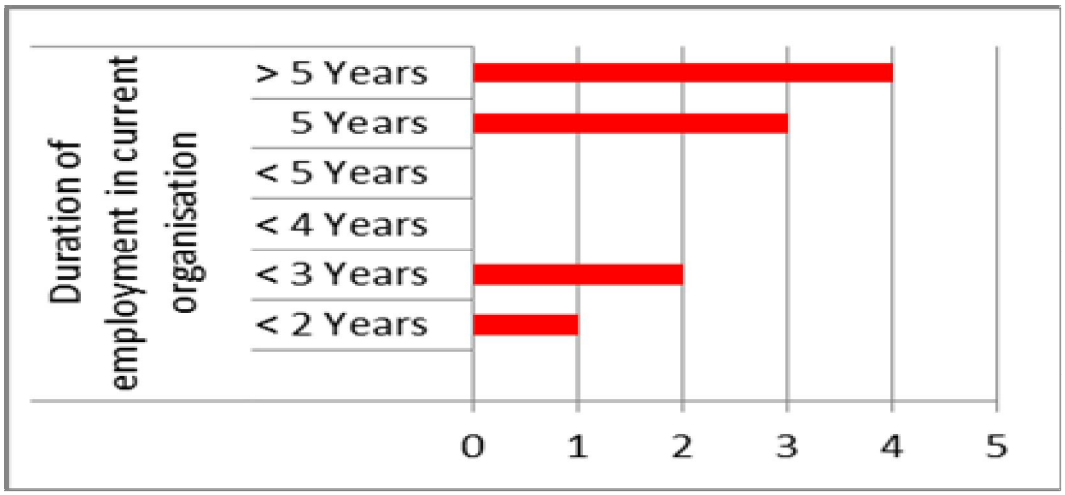


Figure 6: Duration of employment in current organisation

Duration of employment in the current organisation varied from more than five years, by four respondents, to less than two years, by one respondent. Three respondents had been in in the organisation for five years, whilst two were less than three years.

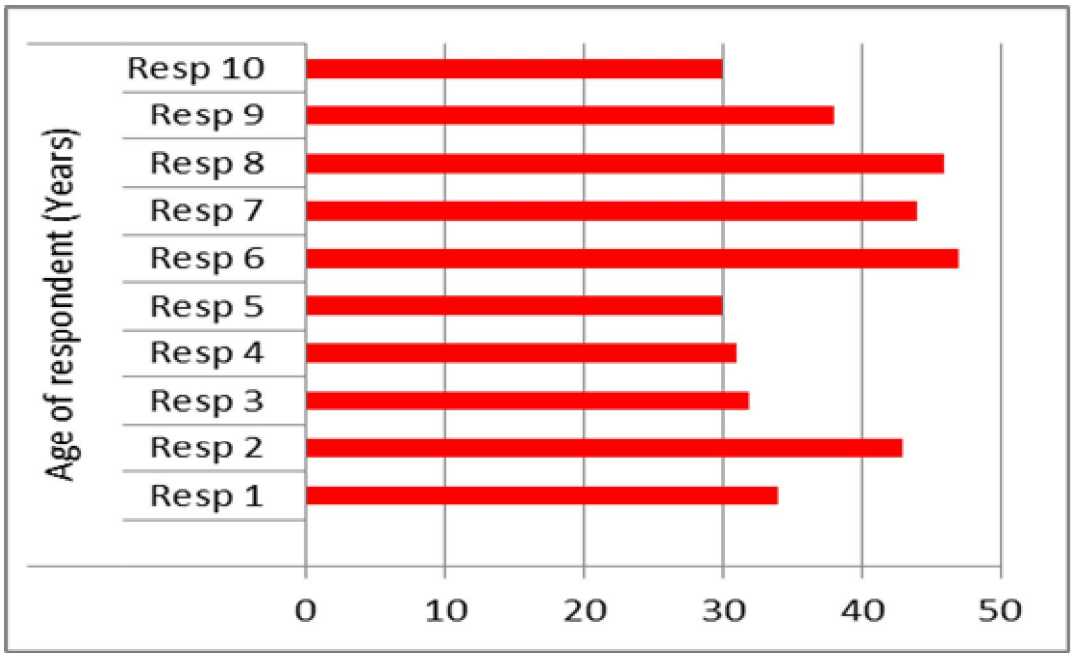


Figure 7: Age of respondents

The age of the respondents varied from the youngest of thirty years (two respondents), to the oldest of forty seven years.

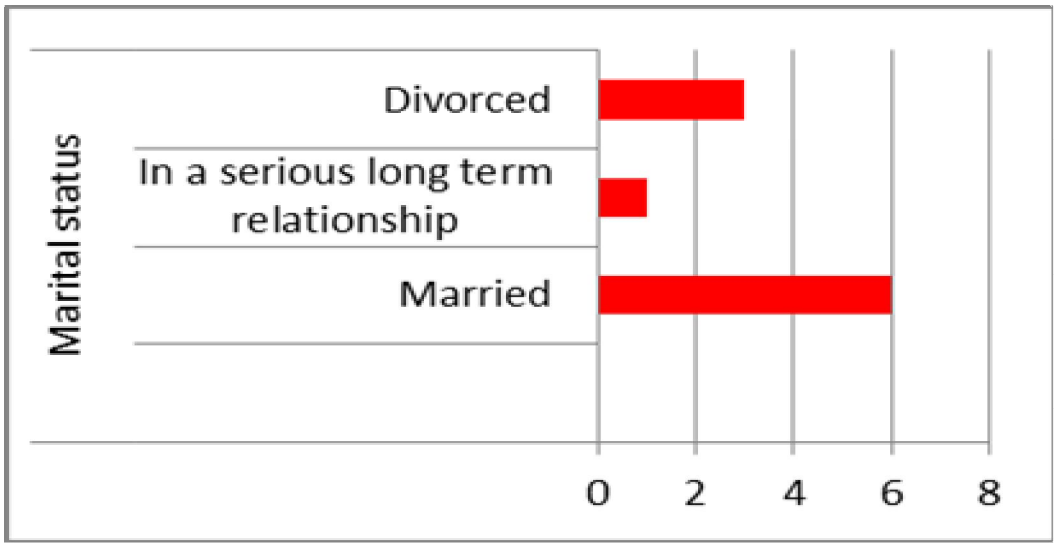


Figure 8: Marital status of respondents

The majority of the respondents, six, were married. Three were divorced, and one was in a serious long term relationship.

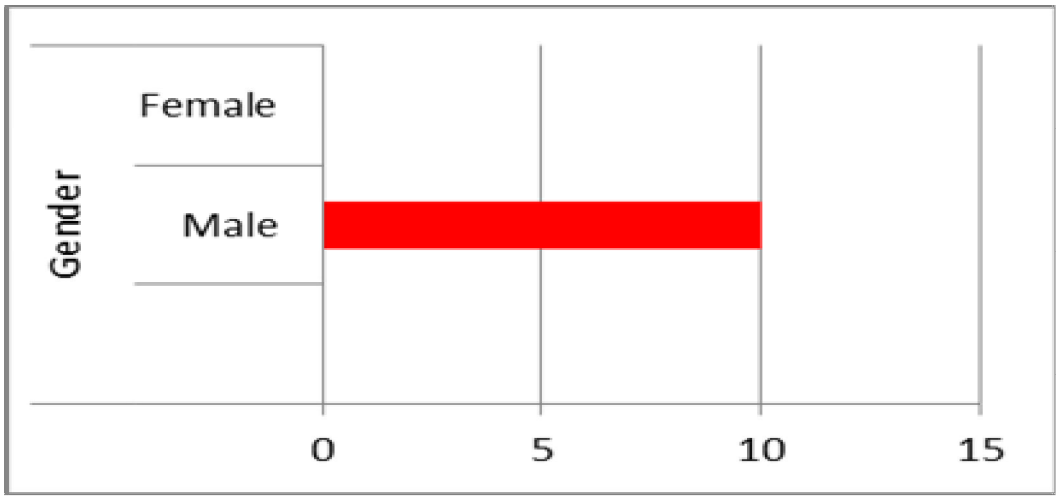


Figure 9: Gender of respondents

All of the respondents were male.

The respondents had spent varying amounts of time onsite, with onsite being defined above. Whilst being onsite, systems engineers are typically allowed to return home at certain intervals for certain periods of time. This varies from

project to project, and is dependent on various factors, such as stage of commissioning, workload, expectation of client, etc.

Shown below is the longest and next longest duration of working onsite by respondents, as well as the average frequency of returning home whilst onsite.

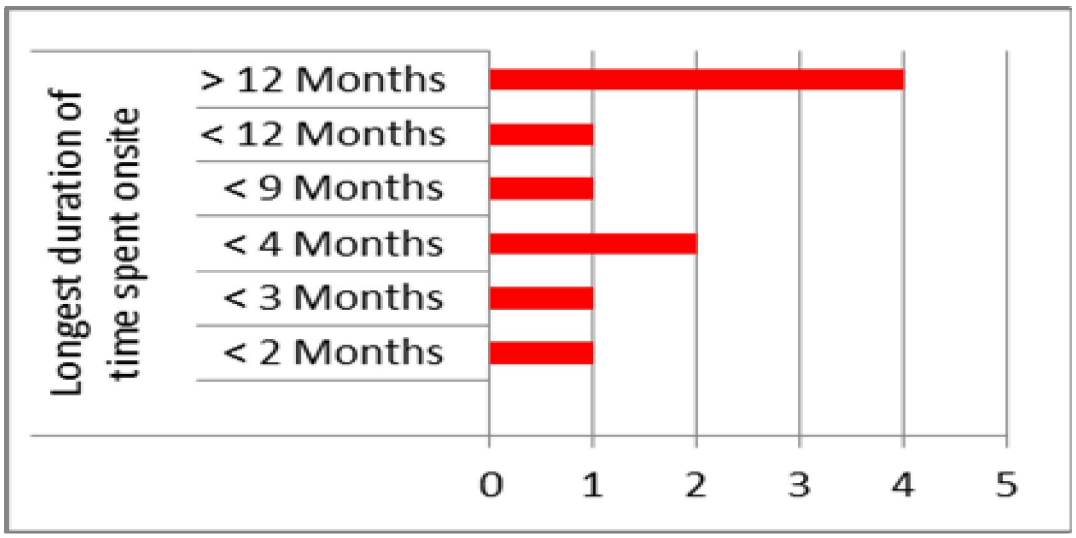


Figure 10: Longest duration of time spent onsite

The longest duration spent onsite by the respondents was more than twelve months by four respondents, and the shortest, by one respondent, was less than two months.

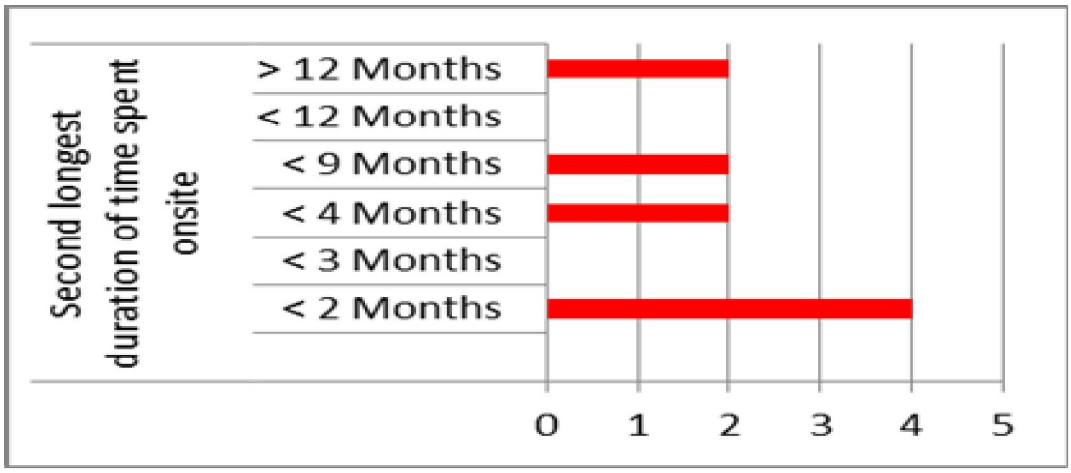


Figure 11: Second longest duration of time spent onsite

The next longest duration spent onsite by the respondents was more than twelve months, by one respondent, and the shortest was less than two months, by four respondents.

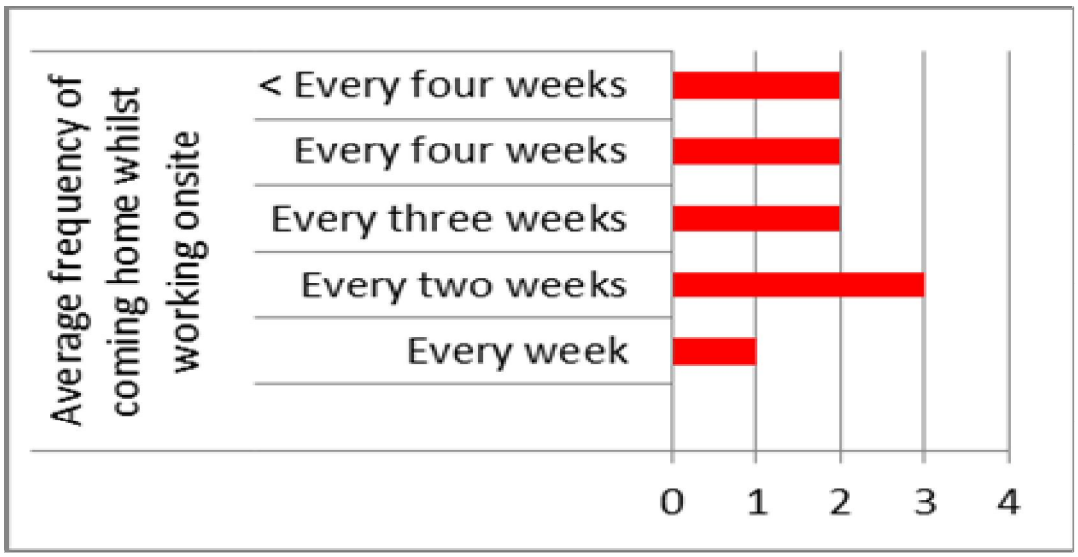


Figure 12: Average frequency of coming home whilst onsite

The average frequency of coming home whilst working onsite varied from longer than every four weeks, by two respondents, to every week, by one respondent.

This section presented the various demographic profiles of the respondents, as well as other important information pertaining to the experiences of the respondents, which have an effect on this research.

4.3 Results pertaining to the Research Proposition

The results pertaining to the research proposition are presented in this section, followed by a brief discussion on these results. These results entail both of the major themes, namely working onsite, and levels of motivation. Finally, a brief conclusion of these results with regards to the research problem is given.

The first sub-problem was to identify the positive and negative aspects of working onsite as perceived by systems engineers.

Therefore the first part of the research was to identify the positives and negatives aspects that systems engineers perceived about working onsite. Each respondent identified and provided a number of both positive and negative factors, from which specific themes were identified, and those factors were grouped under the appropriate theme. Therefore, each theme consisted of a number of factors, and required a more detailed explanation, including the respective factors. This will follow in Chapter 5.

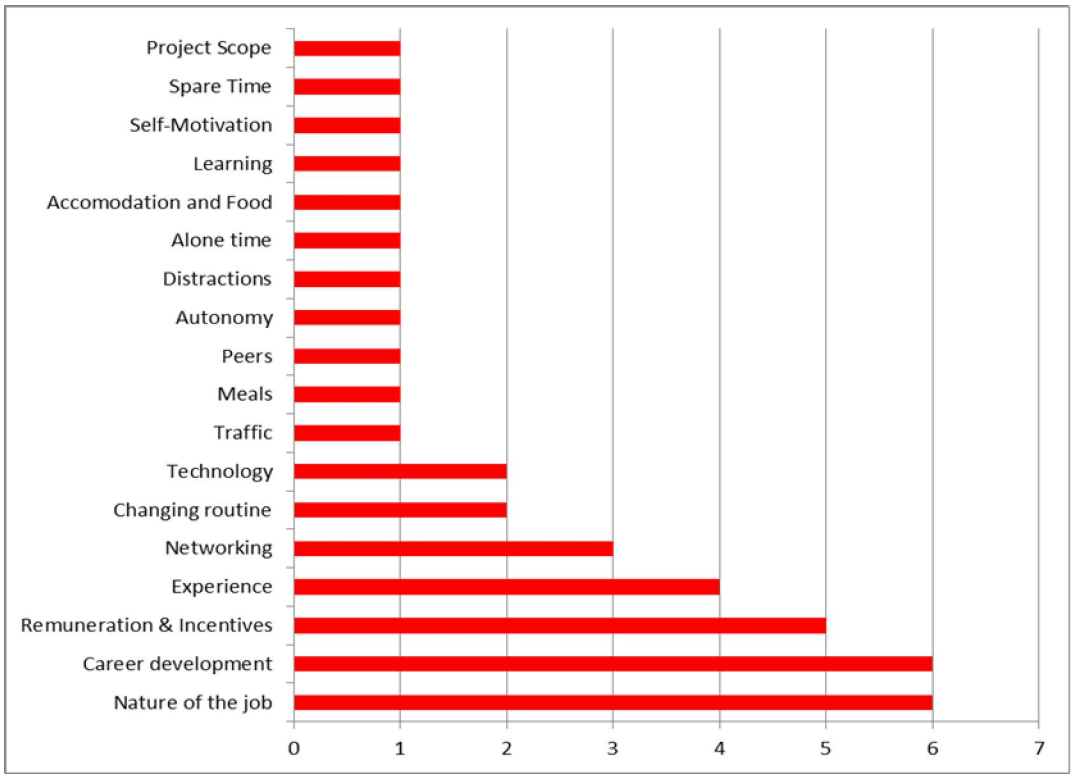


Figure 13: Positive aspects of working onsite

The above figure shows the positive aspects that the respondents perceived about working onsite. The quantity shown indicates the number of respondents that indicated positive factors which could be grouped under that respective aspect.

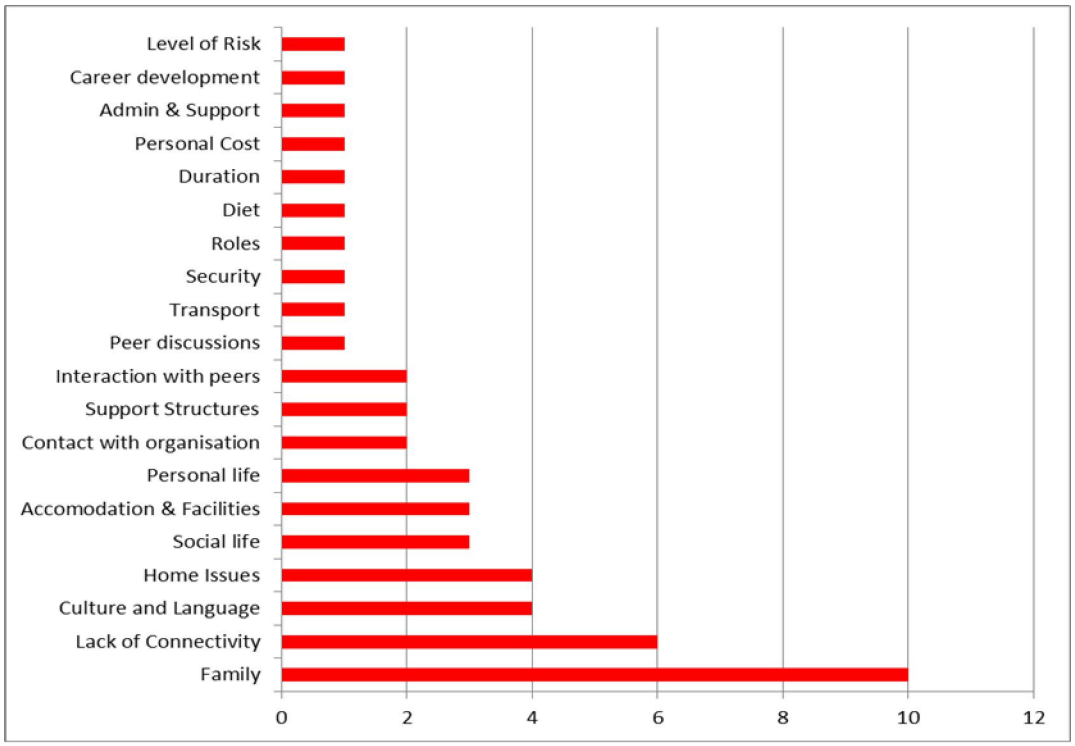


Figure 14: Negative aspects of working onsite

The above figure shows the negative aspects that the respondents perceived about working onsite. The quantity shown indicates the number of respondents that indicated negative factors which could be grouped under that respective aspect.

The second sub-problem was to consider the various factors that influence the individual motivation, both positively and negatively, of system engineers that are present whilst, and due to, working onsite.

The respondents were asked, in their opinion whether the levels of individual motivation in themselves, or other systems engineers they observe generally increased or decreased whilst onsite compared to in the office. This forms a basis upon which to consider the following information gleaned through the research.

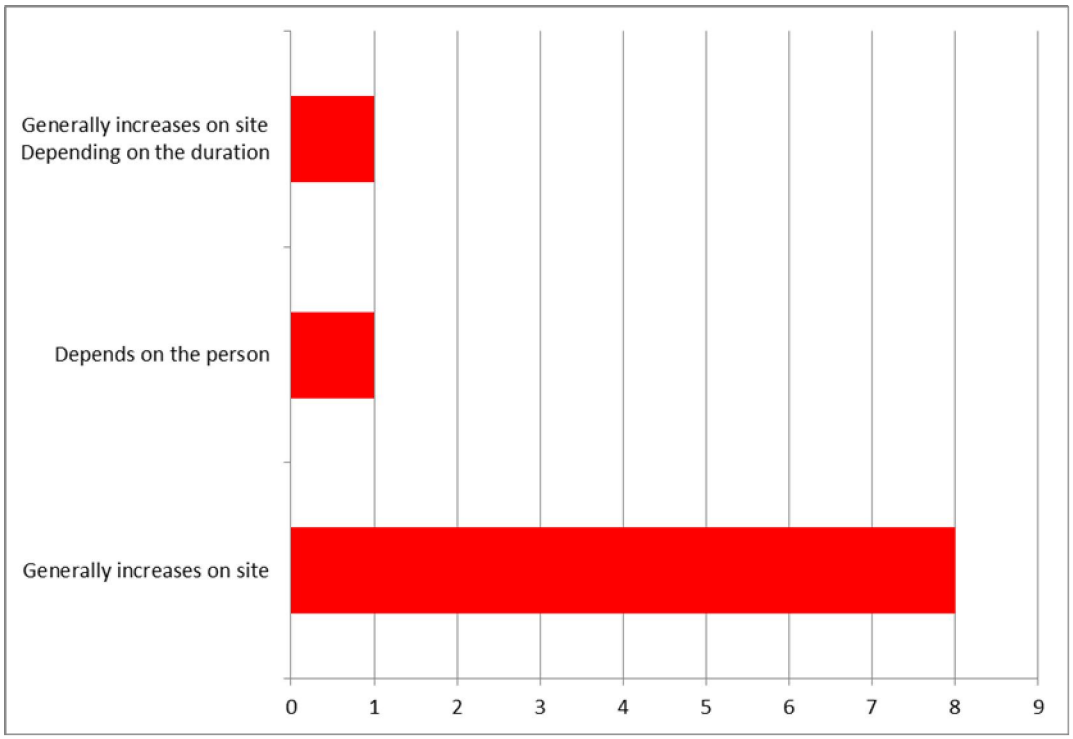


Figure 15: Does the level of motivation of systems engineers increase or decrease whilst onsite as compared to in the office?

The above figure shows how the respondents answered in response to the question in their opinion, whether the levels of individual motivation in themselves, or other systems engineers, generally increased or decreased whilst onsite compared to in the office. The quantity shown indicates the number of respondents that indicated the respective answer.

Furthermore, the research was to identify what positive and negative factors pertaining to working onsite that both positively and negatively influenced the level of motivation of systems engineers. These factors did not necessarily include factors that were present onsite, but also that were present due to the systems engineer being away onsite.

Each respondent identified and provided a number of factors that both positively and negatively affected levels of motivation whilst being onsite, from which specific themes were identified, and those factors were grouped under the appropriate theme. Therefore, each theme consists of a number of factors, and

requires a more detailed explanation, including the respective factors. This will follow in Chapter 5.



Figure 16: Aspects that positively affected levels of motivation

The above figure shows the aspects that the respondents perceived to positively affect levels of motivation whilst onsite. The quantity shown indicates the number of respondents that indicated positive factors which could be grouped under that respective aspect.

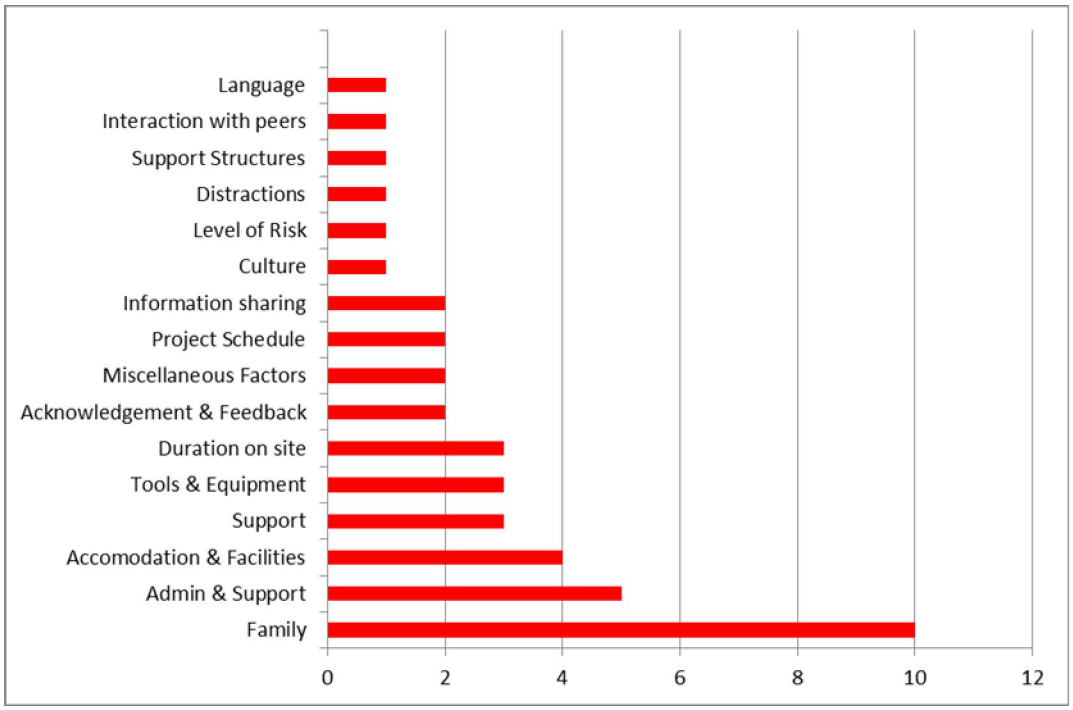


Figure 17: Aspects that negatively affected levels of motivation

The above figure shows the aspects that the respondents perceived to negatively affect levels of motivation whilst onsite. The quantity shown indicates the number of respondents that indicated negative factors which could be grouped under that respective aspect.

Therefore, in conclusion, with regards to the research question to determine what impact working onsite has on the level of individual motivation of systems engineers, the research indicated that the level of motivation increases whilst the systems engineer is onsite, although research indicates that this is dependent on the duration spent onsite and the systems engineer as an individual. The research also indicated that working onsite has its positive and negative aspects, and that there are factors present, both onsite and due to the systems engineer being onsite, that affected the levels of motivation of systems engineers that work onsite both positively and negatively.

This section presented the results pertaining to the research proposition, which was followed by a brief discussion of these results. These results entailed both of the major themes, namely working onsite and levels of motivation. This was

completed with a brief conclusion of these results with regards to the research problem.

4.4 Summary of the results

This chapter presented the demographic profile, and other relevant information pertaining to the respondents interviewed for this research. The profile of the actual group of respondents interviewed was compared with the original envisaged profile, and the deviation and reason therefore was discussed.

Included in the relevant respondent information was the duration of working onsite that were experienced by the respondents, as well as the frequency of returning home during the onsite work.

The positive and negative aspects of working onsite as perceived by the respondents were presented, as well as a discussion of how the factors that were perceived by each respondent contributed to the aspects presented.

The aspects that influenced the levels of motivation of the respondents both positively and negatively that were present onsite, and due to the respondent being onsite, were presented, along with a discussion of how the factors that were perceived by each respondent contributed to these aspects were presented.

Finally, the conclusion of the results in context of the research question was provided, as well as how the research has provided the required information to address the research question.

5. CHAPTER 5: DISCUSSION OF THE RESULTS

5.1 Introduction

This chapter discusses the demographic profile and other relevant information pertaining to the respondents, as well as the difference between the original planned group of respondents, and what was encountered during the research.

A discussion of the research problem follows, which is broken down into three main sections, namely working onsite, motivation and the research question, where the information obtained through the research is compared to the literature, and revised lists of motivational and de-motivational factors are presented, in the context of systems engineers and working onsite. This is followed by a conclusion of the research findings, in the context of the research problem.

Finally, a conclusion of the chapter provides a broad overview of what was presented, discussed and the findings thereof.

5.2 Demographic profile of respondents

A brief discussion on the demographic profile of the respondents, the change to intended sample, and a possible explanation for this change is provided in this section.

It was initially envisaged to approach and interview ten systems engineers that met the required qualifying criteria. The qualifying criteria of the respondents originally envisaged for this study were systems engineers that are married, and between the ages of 30 and 40. However, the sample was expanded to include engineers that are in a serious long term relationship, as well as those who are divorced, and was also expanded to include systems engineers up to an age of 47 years.

Although this resulted in a change of the criteria of the original group, the experiences of this expanded group are valid to this research as systems engineers that are in a serious relationship will experience similar motivational forces as those who are married. In order to increase the relevance of the experiences to this study, the systems engineers that were divorced, who were of ages up to 47 years, were instructed in the interview to consider the times they were onsite during the period when they were married, and to consider the questions asked in the context of being married. This will still be valid to this research in that circumstances onsite will affect the levels of individual motivation of the systems engineer due to their marital status at that time, and therefore of which the engineer would have experience. Although these circumstances may no longer have as large an effect on the engineer, due to the change in the marital status, these would have been prevalent, and therefore valid, during the period that the engineer was married, and can be recollected by the systems engineer for the purposes of this research. This allowed the sample size of ten systems engineers to be met.

ABB South Africa currently employs a relatively large number of systems engineers, of a wide demographic variety. However, not all of these engineers work on Control and Automation projects, thus reducing this potential pool of engineers available for this research. Furthermore, it was found that a large percentage of these systems engineers are below the age of 30 years and are single, reducing the pool available for this study further, to the extent that the original sample had to be expanded.

Therefore, it appears that the original sample group of married engineers, between the ages of 30 and 40, do not represent the majority of the current pool of Control and Automation systems engineers within ABB South Africa, and in fact, it appears that the largest group may consist of engineers either under the age of 30 years, or are single, or both.

This section provided a brief discussion on the demographic profile of the respondents, the change to the intended sample, and a possible explanation for this change.

5.3 Discussion pertaining to the Research Question

This section provides a discussion of the results, first in terms of the research, then in the context of the literature for both main themes, namely working onsite and individual motivation, which provide a revised set of motivational and de-motivational factors, considering both the literature and the results from the research. This is then followed by a presentation and discussion of a revised set of motivational and de-motivational factors that are due to the systems engineer working onsite and a brief conclusion as to what these results suggest.

Considering the research question, which is what impact will working onsite have on the individual levels of motivation of systems engineers, there are two main aspects to this, which is working onsite, and the individual motivation of systems engineers. Each aspect will be examined with regards to the literature, and against the results obtained through the research done.

Considering the aspects of working onsite, in Chapter 4, the positive and negative aspects of working onsite, as perceived by systems engineers was presented, as well as the aspects that positively and negatively affect the levels of motivation of systems engineers whilst onsite. However, these aspects were determined by means of thematic analysis, making use of the Framework approach, as stated in Bryman (2012).

Therefore these aspects or themes have underlying factors, which were identified by the respective respondents in response to the respective question.

Thus, these factors pertaining to the respective aspect or theme are presented to provide a deeper understanding of this aspect, and to assist during comparison and discussion of the literature. In order to identify the larger, more meaningful themes, only the aspects which were identified by more than one respondent are shown and will be discussed below. (For a full list of aspects and accompanying factors, please refer to Appendix C).

The results of the research pertaining to the positives and negatives of working onsite as perceived by the respondents were as follows:

Table 6: Positive aspects of working onsite

ASPECTS:	FACTORS:
Nature of the job:	Being able to do what you love
	Challenging
	Rewarding and fulfilling
	Variety and new challenges
Career development:	Provides good experience
	Exposure to different industries / processes / projects
	Increases career development and future prospects
Remuneration and Incentives:	Overtime remuneration is good
Experience:	Good personal and professional experience gained
	Enables one to grow both professionally and personally
	Increases life skills
	Enables "hands on" experience
Networking:	Good networking opportunities
	Good relationships built
Changing routine:	Each project is different, thus provides a changing routine
	Stimulates interest
Technology	Working on different projects enables the engineer to keep up to date on new technology

The above table presents the positive aspects of working onsite as perceived by the respondents which have been identified by analysis of the various factors provided during the research. These factors therefore provide additional insight to and explanation of the aspects identified and presented, with some of the key aspects and factors being discussed below.

The largest number of positive aspects of working onsite identified by six respondents is Nature of the Job. This indicates that the factors around the job that the engineers perform onsite are positive aspects, and not necessarily being onsite on its own. This would reinforce that the nature of the job on its own has a strong motivational aspect. However, it is interesting to note that the type of work performed onsite is specific to the onsite project environment, and requires that the systems engineer is onsite to actually do the work.

Career development, which was identified as a positive factor by six respondents, suggests that it is the benefit that is derived from being onsite is more of a positive factor, than being onsite itself. Therefore, being onsite results in increased potential to further develop career, mainly through increased experience and exposure.

Similarly, with Experience, Networking and Technology, identified by four, three and two respondents respectively, are also benefits that are derived from being onsite. These positive factors are become present as a result of the systems engineer being onsite, with the benefits thereof being experienced after the systems engineer has worked onsite.

Remuneration and Incentives, identified by five respondents, are also benefits that are derived from being onsite. This takes the form of various allowances and higher pay in the form of increased overtime, which is directly related to the time spent onsite, which the systems engineer can expect.

Changing Routine, which was identified by two as a positive factor, suggest that it is not necessarily a factor that limited to the systems engineer being onsite. This may suggest that any task or activity that provides a change of routine to the systems engineers will be a positive factor, and not specifically working onsite.

Table 7: Negative aspects of working onsite

ASPECTS:	FACTORS:
Family	Being away from family
	Increases stress on family
	Tend to lose contact with family and need to re-adjust when coming back home
	Destroys marriage and family life
	The largest challenge of working onsite
	Spouse takes on additional load
Lack of Connectivity:	Is a big issue both for work and personal aspects
	In work scenarios, time is usually of the essence, and thus fast communication is required
	Need connectivity to keep in contact with family
Culture and Language	Can be difficult when dealing with non-English speaking, non-technical personnel
	New cultures encountered can be challenging
Home Issues:	Continually worried about home issues such as security, maintenance issues, etc.
	Inability of engineer to address these issues personally
	Sometimes require someone to look into home and / or home monitoring
	Security at home
	Difficult to get hold of someone to make repairs, etc.
	Delayed response in case of emergency
Social life:	Not possible to have social life
Accommodation and Facilities:	Lack of and low quality accommodation and facilities
	Bad roads & infrastructure
Personal life:	Not possible to have a personal life
	Personal life ceases whilst onsite
Contact with organisation:	Missing events at the office, such as communications sessions, meetings, and trainings

Support Structures:	Lack of available technical support / resources
	Engineer tends to have to absorb all the pressures from the client
	Engineer forced to sort out all the problems on his own
	More preparation work is required to work onsite
Interaction with peers:	Lack of peer interaction
	Reduces problem solving possibilities

The above table presents the negative aspects of working onsite as perceived by the respondents which have been identified by analysis of the various factors provided during the research. These factors therefore provide additional insight to, and explanation of the aspects identified and presented, and some of the key aspects will be discussed below.

The negative aspect identified by the largest number of respondents, is Family, which was identified by all ten respondents. Some factors contributing to this aspect included just the very act of being away from family; the stress that it causes on a family as a whole; and the additional load it creates on the spouse who remains at home to maintain the required family duties. Some of the respondents took a very negative view of this aspect, identifying factors such as destroyed marriages and home life as a result of working onsite.

Lack of Connectivity, which was lack of connectivity with both family and office, was identified by six respondents. Some of the factors relating to this are linked to the Family aspect, through lack of connectivity to family, which influences the personal aspect of working onsite, and other factors are about lack of connectivity to office, which influences the professional aspect and reduces the effectiveness of the systems engineer to complete other work-related duties.

Culture and Language was identified by four respondents, and indicates that the different culture and language encountered onsite by the engineers was a negative aspect. This entails having to work with diverse cultures and languages whilst fulfilling the required duties of the systems engineer. Projects are often executed internationally, with numerous other international companies working on same project. Therefore it is common in these scenarios to have

employees on site from numerous backgrounds and cultures, speaking various languages. This tends to create barriers to work effectiveness, and sometimes creates personal frustration to the systems engineer encountering and dealing with these various cultures and languages.

Similarly, Home Issues was also identified by four respondents, and includes factors such as the inability of the respondent to make repairs or address issues that may arise at their home, due to his absence. Similarly, security concerns of the house and family, also due to their absence, was a factor. Frustration at the inability of the systems engineer to respond to issues or crises due to the remoteness of the project site, or lack of adequate communications, is experienced by the systems engineer onsite.

Accommodation and Facilities, Social Life and Personal Life were each identified by three respondents. Social and personal life are differentiated in that social life involves interaction with others on a personal level, whilst personal life includes activities such as hobbies or activities one does on one's own. The above aspects indicate the inability of the systems engineer to have a fulfilling social and personal life whilst working onsite. Accommodation and Facilities, entailed the lack of, or the poor quality of the accommodation and facilities available to the engineer, and also includes the poor quality or lack of infrastructure such as roads.

Contact with organisation, Support Structures and Interaction with peers were identified by two respondents as negative aspects to working onsite. Contact with organisation includes factors such as missing events at the office, such as communications sessions, meetings, and training. This is directly attributable to the systems engineer being away onsite. Support Structures includes factors such as the lack of technical support / resources sometimes required by the systems engineer, which results in the systems engineer being forced to perform various roles themselves as required.

When analysing and comparing the positive and negative aspects and factors, it is immediately apparent that some factors are viewed as a positive or negative, depending on the respondent's experience and opinion. Career development

was viewed as a positive factor of working onsite by six respondents, whilst one respondent viewed this as a negative factor. Similarly peer discussions were viewed as a positive factor by one respondent and as a negative by another. Another contrast included accommodation. Three respondents had negative experiences of accommodation, whilst one always had positive experience. These contrasts can be attributed to the differing experiences of the systems engineers whilst onsite, which can vary from project site to project site, as well as varying conditions experienced by the same systems engineer going to the same project site on different occasions. This is also affected by the opinions of the respondents, indicating that what is acceptable for some systems engineers is not acceptable for others. This therefore becomes especially difficult to quantify purely from the aspect of whether this is seen as a positive or negative aspect of being onsite.

When comparing the above results to the literature, there is some agreement with the results. In the literature, three main aspects of working onsite were identified, namely Effect of Work-Life balance of engineers, Effect on the need for participation by engineers, and the Effect on the need for autonomy by engineers. This research indicates that the effect on work-life balance, which encompasses aspects from the research such as Family, Personal Life and Social Life, are affected negatively by being onsite.

Similarly, the research indicates the need for participation, which encompasses aspects from the research such as Networking, Peers, Interaction with Peers, Lack of Connectivity, Support Structures and Contact with Organisation, is affected by working onsite. Although these have either a positive and negative effect, it indicates that certain factors that are present onsite will be seen as substitutions by some respondents for those factors that are not present.

Lastly, the effect on the need for autonomy, which encompassed the aspect Autonomy in the research, was not a dominant aspect of working onsite as indicated by the research. Only one respondent indicated that it was a positive aspect of working onsite. However, the research indicates that it is positively affected by working onsite.

Looking at the second aspect, which is the individual motivation of systems engineers, according to the research, the majority of the respondents indicated that the level of motivation generally increases whilst onsite as compared to at the office, whilst one respondent indicated that it depended on the person, and another that it depended on the duration of being onsite.

However, the research indicates that there are various aspects of being onsite that both positively and negatively influence the levels of individual motivation. These as are listed and discussed below.

Table 8: Aspects that positively affect levels of motivation

ASPECTS:	**FACTORS:**
Acknowledgement and Feedback:	Acknowledgement and feedback from management during the project
	Limited effect if this is done after project
	Recognition required at end of project only
Challenging:	Each project is a unique challenge
	Is the largest motivating factor
Lifecycle of project:	Motivating to be part of the entire lifecycle of the project
Pressure:	Working under time pressure / to a deadline
	Pressure also to finish and go home
Effect of the team:	Is a team effort to maintain motivation
	Depends on the overall level of motivation of the team
	Attitude of client's team has a large effect on engineer's motivation
Autonomy:	Decisions made locally by engineer onsite
	Feel empowered
Experiences	Opportunity to learn and have new experiences onsite
Progress:	Motivating to see progress being made towards completing the project
	Very large effect on motivation

	Successful outcome of project
Remuneration and Incentives:	Positive motivator
Career Advancement:	Is a motivating factor
Interaction with peers:	Interacting with peers onsite increases motivation
Meaningful:	Being part of a greater scheme of things
	The project is important to others
	Becomes meaningful for client by asking for progress and taking an interest in outcome

The above table presents the aspects of working onsite that positively affect levels of motivation of systems engineers as perceived by the respondents which have been identified by an analysis of the various factors provided during the research. These factors therefore provide additional insight to and explanation of the aspects identified and presented, and some of the key aspects will be discussed below.

The aspect which was identified that has a positive effect on levels of motivation by the most respondents, namely seven, is Acknowledgement and Feedback. This entails getting acknowledgement and feedback from company management for the work performed by the systems engineer onsite. The factors which make up this aspect differ somewhat in terms of when acknowledgement and feedback are required, but the salient point is that this is considered an important factor. This aspect relates to the job or work itself, and not working onsite on its own.

Six respondents identified the Challenging and Lifecycle of the Project aspects which have a positive effect on the levels of motivation. Some respondents indicated that the challenging aspect of the project engaged in, which presents a unique challenge for each project, is the largest motivating factor. The lifecycle of the project aspect entails the engineer being part of the entire lifecycle of the project from the beginning to the end. This indicated, and was supported by some respondents, that this was only a motivating factor if the engineer was onsite to commission the project they were busy with from the start. If they were commissioning a project where they were not involved from

the start, then this would cease to be a motivating factor. These two aspects also relate to the job itself, and not to working onsite on its own.

Four respondents identified Pressure, Effect of the Team and Autonomy as aspects which positively affect levels of motivation. The Pressure aspect includes two factors, namely working to a schedule or deadline, and the pressure to work faster to be able to go home earlier. The Effect of the Team includes factors that indicate that the level of motivation of the team as a whole has a large influence on the system engineer's individual level of motivation. This team includes the project team, as well as the client's team. Autonomy is a motivating aspect, which includes factors such as the engineer's feeling of empowerment, and the possibility of the engineer to make decisions locally. This provides an interesting insight, as Autonomy was identified by one respondent only when considering the positive aspects of working onsite, but was identified by four respondents as a motivating factor when working onsite. This seems to suggest that although it may be a motivating factor, it is not considered a positive factor to working onsite.

Experiences and Progress were identified by three respondents respectively as motivating factors. Experiences include the opportunity to learn and experience new things. This tends to relate to both the job itself as well as working onsite. Progress includes factors such as seeing the progress on the project whilst onsite, and the successful outcome of the project. This is limited to the job itself, and not to working onsite.

Two respondents respectively identified Remuneration and incentives, Career Advancement, Interaction with Peers and Meaningful as aspects that positively affect motivation. Remuneration and Incentives is also a positive aspect of working onsite, as well as a motivating factor. This is also a factor which is directly related to working onsite, and not to the job itself. Career Advancement was also identified as a positive effect of working onsite, although six respondents identified it as a positive aspect of working onsite, whilst only two respondents identified it as a positive motivator. Therefore, it seems to indicate that although it is a positive aspect to working onsite, it is not necessarily a good motivator. Interaction with Peers was both a positive and negative aspect of

working onsite, whilst it is considered to have a positive effect on motivation. Meaningful includes factors such as being part of the greater scheme of things, that the work in which the engineer is engaged is important to others, and when the client takes an interest in the progress of the project. This relates to the job itself, and not working onsite, and was neither a positive or negative aspect of working onsite.

Table 9: Aspects that negatively affect levels of motivation

ASPECTS:	**FACTORS:**
Family:	Not being able to spend time with family
	Largest factor affecting motivation onsite
Administration and Support:	Lack of admin and support from organisation in terms of completing travel requisitions, expense claims, etc.
	De-motivating when not engineer's job
Accommodation and Facilities:	Lack of and low quality accommodation and facilities
	Engineers not treated "humanely"
Support:	Lack of support and backing from organisation, both in terms of Project Manager of project and individual's manager
	Lack of support on decisions made by engineer whilst onsite
	Lack of trust from manager in engineers decision-making ability whilst onsite
	Lack of proper planning and arrangements
Tools and Equipment:	Incorrect or insufficient tools and equipment available to do the job properly
Duration onsite:	Length of time affects motivation negatively
	The desire to go home increases proportionally
	Engineers can become "abused" onsite
	If onsite too long, feel cut off from organisation's team
Acknowledgement and Feedback:	Lack of acknowledgement and feedback from management during the project
	Feeling of isolation from organisation
Miscellaneous Factors:	All factors the reduce the ability to do the job successfully

	Including political issues
Project Schedule:	Unrealistically demanding project schedule
	No feedback requested from engineers when project schedule is developed
	If the schedule is not accurate with clearly defined milestones and deadlines
	Commissioning schedule does not allow for the best solution to be implemented, only "good enough".
Information sharing:	Insufficient information or handover from other engineers

The above table presents the aspects of working onsite that negatively affect levels of motivation of systems engineers as perceived by the respondents which have been identified by analysis of the various factors provided during the research. These factors therefore provide additional insight to and explanation of the aspects identified and presented, and some of the key aspects are discussed below.

The aspect which was identified by all the respondents to negatively affect individual motivation was Family. This was identified by most of the respondents as the single largest factor that affected motivation negatively, and entailed not being able to spend time with family or being away from the family. This aspect was also identified by the respondents as the largest negative aspect to working onsite, and is directly related to working onsite, and does not involve aspects of the job itself.

Administration and Support was identified by five respondents to negatively affect levels of motivation. This aspect included factors such as having to perform tasks that were of an administrative nature, for example completion of travel requisitions and expense claims, and especially when it was not the engineer's job to do this, but he was required so to do. This is an aspect of the job, but is directly attributable to working onsite.

Accommodation and Facilities was identified by four respondents to negatively affecting motivation. This included the lack of acceptable quality of accommodation when onsite, and when the engineer did not have access to the required amenities due to the conditions onsite, and thus is not treated in a way

the engineer thought he should be. This involves the conditions onsite, and what is provided for the engineer.

Three respondents respectively identified Support, Tools and Equipment and Duration onsite as aspects that negatively affect levels of motivation. Support includes factors such as lack of support from the engineer's manager and the project manager managing that specific project. It also included lack of support of the engineer's decisions made onsite by the company stakeholders, as well as lack of trust from the engineer's manager in the decision making ability of the engineer, and finally the lack of proper planning and arrangements on the part of the project personnel. Tools and Equipment included the lack of, or insufficient, tools and equipment required to do the job correctly onsite. Duration included factors that indicated that the length of time spent onsite decreases the level of motivation the longer it is. Therefore the level of motivation decreases proportionally with the time spent onsite. Other factors are also influenced by duration onsite, namely that the engineers tend to feel abused and cut off from the organisation the longer they are onsite. Tools and Equipment and Support are related to the job itself, and Duration onsite is directly related to working onsite.

Two respondents respectively identified Acknowledgement and Feedback, Project Schedule and Information Sharing as having a negative impact to motivation. Acknowledgement and Feedback includes not receiving sufficient acknowledgement and feedback from the engineer's manager, and the engineer tending to feel isolated whilst onsite. This is an interesting factor, as it was also identified by seven respondents to positively affect motivation. However, in this case, it is shown that the lack of acknowledgement and feedback affects motivation negatively. This can be seen as essentially the same thing, with the explanation for one being a positive and the other negative, referring to the personal experience of the individual respondent involved. This aspect is job related. Project Schedule is another interesting aspect, and includes factors such as an unrealistic time schedule that has been provided with no or little input from the engineer. Also, lack of clear milestones or deadlines is also a factor, along with not having the time to do a proper job. This

was identified as a positive influence on motivation by four respondents, in that working under pressure to a deadline, positively affected motivation.

The key difference between the two seems to the attainability or possibility to reach the deadline. If the deadline is realistic and attainable, it positively influences motivation, whilst on the other hand, if the engineer cannot meet the deadlines, it becomes a negative factor. This aspect is also job related. Finally Information Sharing involves the lack of information provided to the engineer from other parties in order to fulfil the tasks onsite. Other parties include parties onsite, or from within the engineer's organisation. This aspect is related to both the job and working onsite, as the information is required to do the job, which is exacerbated by the engineer being onsite.

Two respondents identified factors that are grouped under Miscellaneous. These included all the factors that reduced the ability of the engineer to do the job successfully, including political factors relating to the organisation itself and between the organisation and the client.

Although identified by one respondent, one aspect is interesting and requires further discussion, namely Culture. This was identified by one respondent having the largest negative effect on motivation, and varies from site to site. The respondent also indicated that it is a factor that has become manageable as experience in this regard has grown. This was also identified by four respondents to be a negative aspect to working onsite.

Considering the literature reviewed on motivation, which identified various motivational factors, Beecham et al. (2008) provided two lists of motivational factors, shown in Tables 1 and 2 above. Comparing these to the research, these lists have been modified to provide a consolidated list of only the factors which have been confirmed through the research, and exclude those that were not identified through the research.

It must be noted, however, that there are certain aspects that were identified in the research to have a negative effect on motivation, that correlate to the list provided by Beecham et al. (2008) as a Motivating factor. This indicates that the absence or opposite of such a motivating factor identified by Beecham et al.

(2008), is seen as a negative aspect by the respondents. Therefore, in such a case, the negative aspect as identified by the respondents will be indicated under Motivating factors, and not De-motivating factors, in the consolidated lists as shown below.

Furthermore, aspects which have been suggested through the research, but were not identified in the literature, have been added to the lists. This provided complete lists of motivational factors, as suggested by the literature and this research, to be applicable to systems engineers. These are shown below.

For a full comparison of the motivation factors as presented by Beecham et al. (2008) and aspects as identified by the research, please refer to Appendix D.

Consolidated Factors of Motivation as per literature and research

- Rewards and incentives (e.g. scope for increased pay and benefits linked to performance)
- Development needs addressed (e.g. training opportunities to widen skills; opportunity to specialise)
- Variety of work (e.g. making good use of skills, being stretched
- Career path (opportunity for advancement, promotion prospect, career planning)
- Sense of belonging/supportive relationships
- Work / life balance (flexibility in work times, caring manager / employer, work location)
- Employee participation/involvement/working with others
- Feedback
- Technically challenging work
- Autonomy (e.g. freedom to carry out tasks, allowing roles to evolve)

- Appropriate working conditions / environment/good equipment / tools / physical space / quiet
- Making a contribution / task significance (degree to which the job has a substantial impact on the lives or work of other people)
- Sufficient resources

The above list presents the factors of motivation identified by Beecham et al. (2008) which have been compared to the aspects that positively influence motivation of systems engineers as per the research. The motivational factors that correspond to the positive aspects from the research have been maintained, whilst those that did not have any corresponding aspects were excluded. Also, aspects that were not included in the list of motivational factors as presented by Beecham et al. (2008), but were identified through the research, were included in the above table.

The main reason for the differences between the factors identified by the research and those identified in the literature could be suggested due to the context of working onsite. Although most of the factors as identified by Beecham et al. (2008) would still apply to the majority, if not all, of the respondents, in the context of working onsite, these are not of sufficient magnitude to have a large enough effect on the individual levels of motivation, and thus only the largest, and those that imposed the largest effect, on the levels of motivation were included and presented.

For a full comparison of the motivation factors as presented by Beecham et al. (2008) and aspects as identified by the research, please refer to Appendix D.

Consolidated Intrinsic Factors of Motivation as per literature and research

- Challenge (System Engineering is a challenging profession and that in itself is motivating)
- Benefit (creating something to benefit others or enhances well-being)

- Lifecycle – software development, project initiation and feasibility studies, *maintenance (*also found a de-motivating activity)
- Pressure
- Progress

The above list presents the intrinsic factors of motivation identified by Beecham et al. (2008) which have been compared to the aspects that positively influence motivation of systems engineers as per the research. The intrinsic motivational factors that correspond to the positive aspects from the research have been maintained, whilst those that did not have any corresponding aspects were excluded. Also, aspects that were not included in the list of intrinsic motivational factors as presented by Beecham et al. (2008), but were identified through the research, were included in the above table.

Similar to the extrinsic factors or motivation, the main differences are due to the context of working onsite, and also those specific to software engineers, and not systems engineers. The factors that were included were specifically related to working onsite, which could explain why these were not included in the lists provided by the literature.

The literature reviewed also provided a list of de-motivational factors Beecham et al. (2008), shown in Table 3 above. Similarly, comparing these to the research, the list can be modified to only include the factors which have been confirmed through the research, and exclude those that were not identified. Furthermore, aspects which have been suggested through the research can be added to the list to compile a complete list of motivational factors as suggested by this research to be applicable to systems engineers in the context of this research. These are shown below.

For a full comparison of the de-motivation factors as presented by Beecham et al. (2008), and aspects as identified by the research, please refer to Appendix D.

Consolidated Factors of De-Motivation as per literature and research

- Poor communication (feedback deficiency/loss of direct contact with all levels of management)
- Unrealistic goals/phoney deadlines
- Poor working environment (e.g. wrong staffing levels / unstable / insecure / lacking in investment and resources; being physically separated from team)
- Family
- Administration and Support
- Support
- Duration onsite
- Miscellaneous Factors
- Information sharing

The above list presents the factors of de-motivation identified by Beecham et al. (2008) which have been compared to the aspects that negatively influence motivation of systems engineers as per the research. The de-motivational factors that correspond to the negative aspects from the research have been maintained, whilst those that did not have any corresponding aspects were excluded. Also, aspects that were not included in the list of de-motivational factors as presented by Beecham et al. (2008), but were identified through the research, were included in the above table.

For a full comparison of the de-motivation factors as presented by Beecham et al. (2008) and aspects as identified by the research, please refer to Appendix D.

Again, similar to the above, this is mainly due to the context of working onsite. Some of the factors identified in the literature are not applicable to a large enough extent to working onsite to be considered in the results. Although some

respondents had identified one of the factors respectively, again these were not of sufficient magnitude to be included. The factors of de-motivation identified by the research that were not identified in the literature, were specifically related to working onsite.

Finally, considering both the above aspects against the research problem to assess the impact of working onsite on the level of individual motivation of systems engineers, the research indicated that there is generally a positive influence on levels of individual motivation whilst working onsite, and the results further show that working onsite has its positive and negative aspects. There are also factors present, both onsite and due to the systems engineer being onsite that affect the level of motivation of systems engineers that work onsite both positively and negatively.

To identify the aspects of working onsite, as indicated by the research, which affect the factors of motivation, both extrinsic and intrinsic, and de-motivation, as compiled from both the literature and research in the lists above, the positive and negative effects of working onsite will be compared against these consolidated factors of motivation and de-motivation. Thus, the lists provided above can be modified to only include the factors that are affected by either a positive or negative aspect of working onsite, which have been confirmed through the research, and exclude those that were not identified. These are shown below.

It must be noted, however, that there are certain aspects that were identified in the research as a negative aspect to working onsite, that correlate to the list provided by Beecham et al. (2008) as a Motivating factor. This indicates that the absence or opposite of such a motivating factor identified by Beecham et al. (2008), is seen as a negative aspect of working onsite by the respondents. Therefore, in such a case, the negative aspect as identified by the respondents will be indicated under Motivating factors, and not De-motivating factors, in the revised lists as shown below.

For a full comparison of the motivation factors as revised above, in relation to the positive effects of working onsite, please refer to Appendix E.

Factors of Motivation as a result of working onsite

- Rewards and incentives (e.g. scope for increased pay and benefits linked to performance)
- Development needs addressed (e.g. training opportunities to widen skills; opportunity to specialise)
- Variety of work (e.g. making good use of skills, being stretched)
- Career path (opportunity for advancement, promotion prospect, career planning)
- Support
- Sense of belonging/supportive relationships
- Work/life balance (flexibility in work times, caring manager/employer, work location)
- Employee participation/involvement/working with others

The above list presents the factors of motivation as a result of working onsite, which is a comparison between the list of consolidated factors of motivation provided above and the positive aspects of working onsite as identified through the research. The motivational factors that correspond to the positive aspects of working onsite obtained from the research have been maintained, whilst those that did not have any corresponding aspects were excluded.

For a full comparison of the intrinsic motivation factors as revised above, in relation to the positive effects of working onsite, please refer to Appendix E.

Intrinsic Factors of Motivation as a result of working onsite

- Change
- Challenge (Software Engineering is a challenging profession and that in itself is motivating)

The above list presents the intrinsic factors of motivation as a result of working onsite, which is a comparison between the list of consolidated intrinsic factors of motivation and the positive aspects of working onsite as identified through the research. The intrinsic motivational factors that correspond to the positive aspects of working onsite obtained from the research have been maintained, whilst those that did not have any corresponding aspects were excluded.

For a full comparison of the de-motivation factors as revised above, in relation to the negative effects of working onsite, please refer to Appendix E.

Factors of De-Motivation as a result of working onsite

- Poor communication (feedback deficiency/loss of direct contact with all levels of management)
- Poor working environment (e.g. wrong staffing levels / unstable / insecure / lacking in investment and resources; being physically separated from team)
- Family

The above list presents the factors of de-motivation as a result of working onsite, which is a comparison between the list of consolidated factors of de-motivation and the negative aspects of working onsite as identified through the research. The de-motivational factors that correspond to the negative aspects of working onsite obtained from the research have been maintained, whilst those that did not have any corresponding aspects were excluded.

Therefore in conclusion, the research indicates that the level of motivation does increase whilst the systems engineer is onsite, although research indicates that this is dependent on the duration spent onsite and the system engineer as an individual. The research also indicates that working onsite does influence the levels of individual motivation of systems engineers both positively and negatively. Therefore, the research question that working onsite will have an impact on the individual levels of motivation of systems engineers has been

answered, and further information is provided to identify what the aspects are of working onsite that influence the levels of motivation positively and negatively.

This section provided a discussion of the results, first in terms of the research, then in the context of the literature for both main themes, namely working onsite and individual motivation, which resulted in a revised set of motivational and de-motivational factors, considering both the literature and the results from the research. A presentation and discussion of a revised set of motivational and de-motivational factors that are due to the systems engineer working onsite was provided, followed by a brief conclusion as to what these results suggested.

5.5 Conclusion

This chapter discussed the demographic profile and other relevant information pertaining to the respondents, as well as the difference between the original planned group of respondents, and what was encountered during the research.

The research problem was discussed, broken down into three main sections, namely working onsite, motivation and the research question, where the information obtained through the research was compared to the literature, and revised lists of motivational and de-motivational factors were presented in the context of systems engineers and working onsite. This was followed by a conclusion of the research findings in the context of the research problem.

In conclusion, the research indicates that the level of motivation does generally increase whilst the systems engineer is onsite, and also indicates that working onsite does influence the levels of individual motivation of systems engineers both positively and negatively, with the largest effect coming from family and related factors, such as home issues. This also corresponds to the largest negative aspect of working onsite as identified by the respondents.

Finally, in response to the research question, the research has shown that working onsite will have an impact on the individual levels of motivation of systems engineers, and has also provided further information by identifying the

positive and negative aspects of working onsite that influence the levels of motivation both positively and negatively.

6. CHAPTER 6: CONCLUSIONS AND RECOMMENDATIONS

6.1 Introduction

This chapter provides the final, summarised conclusions of the research in the context of the research and the published literature.

The recommendations to the interested stakeholders that were identified earlier are presented and discussed, including the practical value provided by the research.

Finally, suggestions for further research are presented that arose due to the current research that would enable others to further research avenues and questions that are related to this research and were not included in this report.

6.2 Conclusions of the study

The conclusions of the study are presented and discussed, what the study provided from both a consideration of the literature and research, and then with the consideration of working onsite. Finally, a conclusion with regards to the research question is presented.

In the context of a South African engineering company, which in this study, was represented by ABB South Africa, this study has identified numerous points.

Firstly, the research has determined that working onsite by systems engineers in this study has positive and negative aspects, as percieved by the respective systems engineers.

Secondly, the factors of motivation and de-motivation identified for software engineers by Beecham et al. (2008), correspond to a certain extent to systems engineers in a South African engineering company, as identified in this study. The factors of extrinsic motivation correspond to the largest extent, the intrinsic factors of motivation corresponding slightly less, with the research identifying an

additional two factors that were not included in the literature, and the factors of de-motivation corresponding the least to that suggested by the literature, with the inclusion of the greatest number of factors identified by the research that were not included in the literature.

The differences in the above were mostly due to the context of working onsite, and the factors that were not included were not great enough as identified by the majority of the respondents to have a significant effect, and thus were not included in the results.

This has provided overall lists of motivational and de-motivational factors that are specific to systems engineers, working onsite for a South African engineering company, with the largest factor affecting motivation, and correspondingly the greatest negative aspect identified by the respondents of working onsite, is Family and related issues.

Lastly, working onsite has definite positive and negative effects on levels of individual motivation of systems engineers. Final lists of motivational and de-motivational factors with respect to, and directly affected by, working onsite were provided. These lists built upon the initial lists as identified by Beecham et al. (2008), and were edited to incorporate the motivational characterisitics of systems engineers, and finally were analysed with regards to the effects of working onsite to produce a final list of motivational and de-motivational factors that are specific to systems engineers working onsite.

Therefore, this research has answered the research question by determining that working onsite has a definite impact on the levels of individual motivation of systems engineers in a South African engineering company, as well as providing final lists of motivational and de-motivational factors that apply to systems engineers whilst working onsite.

In this section, the conclusions of the study were presented and discussed, what the study provided from both a consideration of the literature and research, and then with the consideration of working onsite. The section ended off with a conclusion with regards to the research question.

6.3 Recommendations

This section presents and discusses any recommendations that arose through, and as a result of, the literature review, research and findings.

The research provided a foundation for further research that could provide further, more detailed information on the effect that working onsite has on the individual motivation of systems engineers who are required to work onsite for project purposes.

HR and Business Managers can use the information suggested by this research to gain clarity as to how working onsite may influence the individual motivation of the systems engineers that they employ and assign engineers to different projects depending on each project situation and requirements. This information will also be able to provide the basis and reasoning upon which HR Managers, and similar interested parties, can create and implement policies which emphasise the positive motivational aspects, whilst minimising or avoiding the negative motivational aspects.

Finally, motivation is one of many aspects that influence job outcomes, as described above by Sharp et al. (2009). Therefore, in an effort to positively influence job outcome, increasing knowledge of one of the factors, namely motivation, will assist the HR and Business Manager to increase productivity and satisfaction of systems engineers in the workplace.

Any recommendations that arose through, and as a result of, the literature review, research and findings, were presented and discussed in this section.

6.4 Suggestions for further research

All suggestions for further research that arose through, or as a result of this research are presented and discussed in this section.

Further research may include expanding the target group of systems engineers to include those in a different age group and marital status. The research has suggested that there will be other significant factors that influence these groups

that were not present to the group researched, due to the group demographics. Although not specified in this research, including the demographic of gender to create a gender based group may highlight certain, specific factors.

This research only included systems engineers that worked onsite on a relatively short term basis, which was temporary. There are also engineers who take long term assignments, which are up to a period of two to five years, and therefore may also provide different factors that influence motivation than those identified in this research.

Further research may include the groups of respondents from other South African, and perhaps internationally based, engineering companies. Similarly, other positions within these companies may be considered that are also required to spend time onsite for different reasons than the systems engineers, but may also highlight other factors that are relevant due to being onsite.

Further research could include a comparative study of systems engineers that have not worked onsite and those that have worked onsite. This would remove the moderating factor of working onsite, and this would determine if significantly different results were obtained through the research.

Lastly, considering groups of people that work for other companies, rather than engineering based ones. These companies would also require personnel to work onsite, but for different reasons and other duties as those respondents included in this research, but also experiencing relevant factors due to being onsite.

In this section, all suggestions for further research that arose through, or as a result of this research were presented and discussed.

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APPENDIX A

Actual Research Instrument

INTERVIEW GUIDE

This guide will provide the key areas of discussion for the research into the impact of working onsite on individual motivation of systems engineers in a project environment.

Section 1: Background Information

Respondent Position: _____

Duration of position held: _____

Previous position held: _____

Duration of previous position: _____

Duration of employment in organisation: _____

Age of Respondent: _____

Marital Status: _____

Summary of duties in current position:

_____

_____

_____

Section 2: Research Section

Working onsite:

1. How many times have you been required to work onsite for durations longer than one month, and at distances of more than 250kms from the office?

2. What were the typical durations under which you have been required to work onsite as indicated above, as well as how often did you return home during the those periods onsite?

3. Please describe, in your opinion, the positive and negative aspects to working onsite.

Individual motivation:

1. In your opinion and based upon your experience, is it generally possible to determine by observation whether you, and/or other systems engineers, are motivated or not?

2. In your opinion and based upon your experience, does the level of motivation of systems engineers, including yourself and other systems engineers you have observed, generally increase or decrease whilst onsite?

3. In your opinion and based upon your experience, what are factors that are present onsite, and related to being onsite, that positively influence the level of individual motivation?

4. In your opinion and based upon your experience, what are factors that are present onsite, and related to being onsite, that negatively influence the level of individual motivation?

5. Do you think that these factors, both positive and negative, are specific only to the group of systems engineers we are researching?

APPENDIX B

Consistency matrix

Table 10: Consistency Matrix

The impact of working onsite on the level of individual motivation of systems engineers					
Sub-problem	**Literature Review**	**Research questions**	**Source of data**	**Type of data**	**Analysis**
Working onsite	Beecham, S., Baddoo, N., Hall, T., Robinson, H., & Sharp, H. (2008) Crawford, J. O., MacCalman, L., & Jackson, C. A. (2011) Galinsky, E., Bond, J. T., & Friedman, D. E. (1993) Kofodimos, J. R. (1993) Kurkland, N. B., & Bailey, D. E. (1999) Lambert, A. D., Marler, J. H., & Gueutal, H. G. (2008) Michel, J. S., Mitchelson, J. K., Kotrba, L. M., LeBreton, J. M., & Baltes, B. B. (2009) McNamara, T. K., Pitt-Catsouphes, M., Matz-Costa, C., Brown, M., & Valcour, M. (2013)	Will working onsite have an impact on the individual levels of motivation of systems engineers?	Actual interview that will provide the data in words	Data from words	Thematic analysis

The impact of working onsite on the level of individual motivation of systems engineers					
Sub-problem	**Literature Review**	**Research questions**	**Source of data**	**Type of data**	**Analysis**
Individual motivation of systems engineers	Adams, J. S. (1963) Beecham, S., Baddoo, N., Hall, T., Robinson, H., & Sharp, H. (2008) Boehm, B. W. (1981) DeMarco, T., & Lister, T. (1999) França, A. C. C., & da Silva, F. Q. (2010) França, A. C. C., da Silva, F. Q. B., Felix, A. d. L. C., & Carneiro, D. E. S. (2013) Frangos, S. A. (1998) Hackman, J. R. (1987) Hackman, J. R., & Oldham, G. R. (1976) Herzberg, F., Mausner, B., & Snyderman, B. B. (1959) Latham, G. P., & Ernst, C. T. (2006) Latham, G. P., & Pinder, C. C. (2005) Locke, E. A., & Henne, D. (1986) Maslow, A. H. (1943) McConnell, S. (1998) Nord, W. R. (1969) Porter, L. W. (1961) Porter, L. W. (1962) Porter, L. W. (1963a)	Will working onsite have an impact on the individual levels of motivation of systems engineers?	Actual interview that will provide the data in words	Data from words	Thematic analysis

The impact of working onsite on the level of individual motivation of systems engineers					
Sub-problem	**Literature Review**	**Research questions**	**Source of data**	**Type of data**	**Analysis**
Individual motivation of systems engineers	Porter, L. W. (1963b) Porter, L. W. (1963) Sharp, H., Baddoo, N., Beecham, S., Hall, T., & Robinson, H. (2009) Taylor, F. W. (1911) Viteles, M. S. (1932) Vroom, V. H. (1964)	Will working onsite have an impact on the individual levels of motivation of systems engineers?	Actual interview that will provide the data in words	Data from words	Thematic analysis

APPENDIX C

Table 11: Full list of positive aspects of working onsite

ASPECTS:	FACTORS:
Nature of the job:	Being able to do what you love
	Challenging
	Rewarding and fulfilling
	Variety and new challenges
Career development:	Provides good experience
	Exposure to different industries / processes / projects
	Increases career development and future prospects
Remuneration and Incentives:	Overtime remuneration is good
Experience:	Good personal and professional experience gained
	Enables one to grow both professionally and personally
	Increases life skills
	Enables "hands on" experience
Networking:	Good networking opportunities
	Good relationships built
Changing routine:	Each project is different, thus provides a changing routine
	Stimulates interest
Technology	Working on different projects enables the engineer to keep up to date on new technology
Traffic:	Reduced traffic encountered
Meals:	No need to prepare food, etc.
Peers:	Enables learning from peers working at the project site.
	Not good to work with an incompetent team

Autonomy:	Decisions made locally by engineer onsite
	Discretion of engineer as representative of company
Distractions:	No distractions, can focus on job at hand
Alone time:	Possible to get alone time, away from family and work issues
Accommodation and Food:	Always ensured had good accommodation and lodging
Learning:	Very steep learning curve
Self-Motivation:	Pushes the engineer to be self-motivated
Spare Time:	More spare time available after hours to catch up on outstanding work issues
Project Scope:	Exposure to a much wider scope of the project, outside the engineer's current scope

Table 12: Full list of negative aspects of working onsite

ASPECTS:	FACTORS:
Family	Being away from family
	Increases stress on family
	Tend to lose contact with family and need to re-adjust when coming back home
	Destroys marriage and family life
	The largest challenge of working onsite
	Spouse takes on additional load
Lack of Connectivity:	Is a big issue both for work and personal aspects
	In work scenarios, time is usually of the essence, and thus fast communication is required
	Need connectivity to keep in contact with family
Culture and Language	Can be difficult when dealing with non-English speaking, non-technical personnel
	New cultures encountered can be challenging
Home Issues:	Continually worried about home issues such as security, maintenance issues, etc.
	Inability of engineer to address these issues personally
	Sometimes require someone to look into home and / or home monitoring
	Security at home
	Difficult to get hold of someone to make repairs, etc.
	Delayed response in case of emergency
Social life:	Not possible to have social life
Accommodation and Facilities:	Lack of and low quality accommodation and facilities
	Bad roads & infrastructure
Personal life:	Not possible to have a personal life
	Personal life ceases whilst onsite
Contact with organisation:	Missing events at the office, such as communications sessions, meetings, and trainings

Support Structures:	Lack of available technical support / resources
	Engineer tends to have to absorb all the pressures from the client
	Engineer forced to sort out all the problems on his own
	More preparation work is required to work onsite
Interaction with peers:	Lack of peer interaction
	Reduces problem solving possibilities
Peer discussions:	NOT that big a negative
Transport:	The need to share transport limits independence
Security:	Lack of security onsite and at lodging
Roles:	The various roles engineers must take onsite such as: Customer relations, Project Management, Training, etc.
Diet:	Specialised dietary requirements not always catered for
Duration:	The duration of 5 weeks continuously onsite is too long
	Factor of missing family gets too big after this period
Personal Cost:	Personal costs are encountered
Administration and Support:	Lack of admin and support from organisation in terms of completing travel requisitions, expense claims, etc.
Career development:	Not good for career development
	Become forgotten
Level of Risk:	Risk of transport to site (mode of transport and conditions)
	Risk of being onsite

Table 13: Full list of aspects and factors that positively influence levels of motivation

ASPECTS:	FACTORS:
Acknowledgement and Feedback:	Acknowledgement and feedback from management during the project
	Limited effect if this is done after project
	Recognition required at end of project only
Challenging:	Each project is a unique challenge
	Is the largest motivating factor
Lifecycle of project:	Motivating to be part of the entire lifecycle of the project
Pressure:	Working under time pressure / to a deadline
	Pressure also to finish and go home
Effect of the team:	Is a team effort to maintain motivation
	Depends on the overall level of motivation of the team
	Attitude of client's team has a large effect on engineer's motivation
Autonomy:	Decisions made locally by engineer onsite
	Feel empowered
Experiences	Opportunity to learn and have new experiences onsite
Progress:	Motivating to see progress being made towards completing the project
	Very large effect on motivation
	Successful outcome of project
Remuneration and Incentives:	Positive motivator
Career Advancement:	Is a motivating factor
Interaction with peers:	Interacting with peers onsite increases motivation
Meaningful:	Being part of a greater scheme of things
	The project is important to others

	Becomes meaningful for client by asking for progress and taking an interest in outcome
Meeting new people:	Opportunity to meet new people onsite
Loyalty:	High loyalty to company
Changing routine:	Each project is unique
Project Management:	How well the project is managed and run affects motivation
Responsibility and Ownership:	Taking ownership of that portion of the project
System:	The opportunity to work on a real, live system
Company Gestures:	When the company makes gestures to accommodate the special requirements of the engineer

Table 14: Full list of aspects and factors that negatively influence levels of motivation

ASPECTS:	FACTORS:
Family:	Not being able to spend time with family
	Largest factor affecting motivation onsite
Administration and Support:	Lack of admin and support from organisation in terms of completing travel requisitions, expense claims, etc.
	De-motivating when not engineer's job
Accommodation and Facilities:	Lack of and low quality accommodation and facilities
	Engineers not treated "humanely"
Support:	Lack of support and backing from organisation, both in terms of Project Manager of project and individual's manager
	Lack of support on decisions made by engineer whilst onsite
	Lack of trust from manager in engineers decision-making ability whilst onsite
	Lack of proper planning and arrangements
Tools and Equipment:	Incorrect or insufficient tools and equipment available to do the job properly
Duration onsite:	Length of time affects motivation negatively
	The desire to go home increases proportionally
	Engineers can become "abused" onsite
	If onsite too long, feel cut off from organisation's team
Acknowledgement and Feedback:	Lack of acknowledgement and feedback from management during the project
	Feeling of isolation from organisation
Miscellaneous Factors:	All factors the reduce the ability to do the job successfully
	Including political issues
Project Schedule:	Unrealistically demanding project schedule
	No feedback requested from engineers when project schedule is developed
	If the schedule is not accurate with clearly defined milestones and deadlines

	Commissioning schedule does not allow for the best solution to be implemented, only "good enough".
Information sharing:	Insufficient information or handover from other engineers
Culture:	Largest factor affecting motivation onsite
	Depends on individual sites / personnel
	Is manageable though
Level of Risk:	Risk of transport to site (mode of transport and conditions)
	Risk of being onsite
Distractions:	Distractions can have a large negative effect on motivation
Support Structures:	Lack of available technical support / resources
Interaction with peers:	Working with some types of people can be de-motivating
	People who don't want to share or not open to new things
Language	New languages encountered can be challenging

APPENDIX D

Table 15: Comparison of motivational factors as identified in literature to those identified through the research

FACTORS OF MOTIVATION (Beecham, et al., 2008)	FACTORS OF MOTIVATION (RESEARCH)	FACTORS OF DEMOTIVATION (RESEARCH)
Rewards and incentives (e.g. scope for increased pay and benefits linked to performance)	Remuneration and Incentives	
Development needs addressed (e.g. training opportunities to widen skills; opportunity to specialise)	Experiences	
Variety of work (e.g. making good use of skills, being stretched	Changing routine	
Career path (opportunity for advancement, promotion prospect, career planning)	Career Advancement	
Sense of belonging/supportive relationships	Effect of the team	Support
Work/life balance (flexibility in work times, caring manager/employer, work location)		Family
Employee participation/involvement/working with others	Interaction with peers	Interaction with peers
Feedback	Acknowledgement and Feedback	Acknowledgement and Feedback
Technically challenging work	Challenging	

Autonomy (e.g. freedom to carry out tasks, allowing roles to evolve)	Autonomy	
Appropriate working conditions/environment/good equipment/ tools/physical space/quiet		Distractions
Making a contribution/task significance (degree to which the job has a substantial impact on the lives or work of other people)	Meaningful	
Sufficient resources		Tools and Equipment

Table 16: Comparison of intrinsic motivational factors as identified in literature to those identified through the research

INTRINSIC FACTORS OF MOTIVATION (Beecham, et al., 2008)	FACTORS OF MOTIVATION (RESEARCH)	FACTORS OF DEMOTIVATION (RESEARCH)
Challenge (Software Engineering is a challenging profession and that in itself is motivating)	Challenging	
Benefit (creating something to benefit others or enhances well-being)	Meaningful	
Lifecycle – software development, project initiation and feasibility studies, *maintenance (*also found a de-motivating activity)	Lifecycle of project	
		Pressure
		Progress

Table 17: Comparison of de-motivational factors as identified in literature to those identified through the research

FACTORS OF DE-MOTIVATION (Beecham, et al., 2008)	FACTORS OF MOTIVATION (RESEARCH)	FACTORS OF DEMOTIVATION (RESEARCH)
Poor communication (feedback deficiency/loss of direct contact with all levels of management)		Acknowledgement and Feedback
Unrealistic goals/phoney deadlines		Project Schedule
Poor working environment (e.g. wrong staffing levels/unstable/insecure/lacking in investment and resources; being physically separated from team)		Tools and Equipment
		Accommodation & Facilities
		Family
		Administration and Support
		Support
		Duration onsite
		Miscellaneous Factors
		Information sharing

APPENDIX E

Table 18: Revised factors of motivation including the positive aspects of working onsite

REVISED FACTORS OF MOTIVATION	POSITIVES OF WORKING ONSITE	NEGATIVES OF WORKING ONSITE
Rewards and incentives (e.g. scope for increased pay and benefits linked to performance)	Remuneration and Incentives	
Development needs addressed (e.g. training opportunities to widen skills; opportunity to specialise)	Experience	
Variety of work (e.g. making good use of skills, being stretched	Changing routine	
Career path (opportunity for advancement, promotion prospect, career planning)	Career development	Career development
Support (Lack Of)		Support Structures
Sense of belonging/supportive relationships (Lack of)		Lack of Connectivity
Work/life balance (flexibility in work times, caring manager/employer, work location) (Lack of)		Personal life
Employee participation/involvement/working with others (Lack of)		Interaction with peers

Table 19: Revised factors of intrinsic motivation including the positive aspects of working onsite

REVISED FACTORS OF INTRINSIC MOTIVATION	POSITIVES OF WORKING ONSITE	NEGATIVES OF WORKING ONSITE
Change	Changing routine	
Challenge (Software Engineering is a challenging profession and that in itself is motivating)	Nature of the job	

Table 20: Revised factors of de-motivation including the negative aspects of working onsite

REVISED FACTORS OF DE-MOTIVATION	POSITIVES OF WORKING ONSITE	NEGATIVES OF WORKING ONSITE
Poor communication (feedback deficiency/loss of direct contact with all levels of management)		Lack of Connectivity
Poor working environment (e.g. wrong staffing levels/unstable/insecure/lacking in investment and resources; being physically separated from team)		Accommodation and Facilities
Family		Family