FACTORS AFFECTING THE PERFORMANCE OF SYSTEM SUPPORT ENGINEERS

Jayasundara Hewage Piumi Chathurika Madugee Dabare

(179103F)

Degree of Master of Business Administration in Information Technology

Department of Computer Science and Engineering

University of Moratuwa

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Declaration of the candidate & Supervisor

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Dedication

To

My Mother

A strong and gentle soul who guided me to win my life

My uncle

For being my guardian during my every life event

My Partner

For being my life partner and my best friend and my supporter all the time

Acknowledgments

I would like to acknowledge everyone who helped me in my academic achievements. First of all, my parents and spouse, who supported me with love and understanding. Without you, I could never have reached this current level of success. Secondly, to all my lecturers and supervisor, each of whom has provided patient advice and guidance throughout the research process. Thank you all for your unwavering support.

Abstract

System Support Work is rapidly growing area in the IT industry for production systems. According to current statistics, several companies are spending one-third of the budget for their IT maintenance. It maintenance took support engineers to the IT industry. This makes the opportunity to growth of system support engineers within the IT industry, and still, it is a growing area among the IT sector. Considering experiences of support engineers, most of them facing several difficulties during career path changes, level of technical competency within other software engineers such as developers, Quality Assurance, etc. Moreover, there is a tendency to assign one engineer to a system for an extended period of support and maintenance.

The research was conducted to identify factors negatively affecting to system support engineers with their long term tenure. Personal productivity is the most crucial factor in an organization's productivity. Individual failure has a direct impact on project failure, and it will impact an organization negatively. Therefore, the importance of identifying these factors are helping to improve the productivity of the organization while motivating individual workers.

There are two main factors called intrinsic and extrinsic factors impact on employee motivation or demotivation. Intrinsic factors are characteristics of engineers, and extrinsic factors management, company culture, etc. are the effect of the factors from externally. Less challenging work, less recognition comes under intrinsic factors and rewards, promotions are some of the extrinsic factors.

As a final result of the survey, the researcher has identified that awards, monetary compensation, leadership, team collaboration, and new technologies are crucial extrinsic factors which are directly impact on system support engineer productivity. Recognition, challenging work, repetitive works is the main factors for system support engineers sensitive to their productivity.

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List of Abbreviations

Name	Abbreviation
ITIL	Information Technology Infrastructure Library
IT	Information Technology
QA	Quality Assurance
TM	Technical Managers
AUC	Area Under the Curve
ROC Curve	Receiver Operating Characteristic Curve
SPSS	Statistical Package for the Social Sciences
BAU	Business As Usual

1. INTRODUCTION

1.1 Overview

This first chapter is focused on demotivation factors of system support engineers in the IT sector. According to ITIL process system, support engineers are the engineers who are providing technical support and maintaining production level systems. This chapter states information associated with the background and motivation of the study; problem identified to perform the research, objectives of the research, research design, and the implication of the study.

1.2 Background

System support engineers are supporting their customers with knowledge including proficiency, perceptions, and view of the root cause of the issue, indication, and the way of customer experiencing the issue within an organizations products or services, as well as the way they are resolving and handing issues (Gary & Durcikova, 2014, p.162). System support engineers tend to use the knowledge which is stored in the repository rather than the supply of knowledge in organizations. It is essential to encourage them to develop their skills Markes (2006) as it enhances their employability. Communication, customer handling, pro-activeness, and quick decision making are some of the skill areas they need to improve to provide better service to their customers.

Importance of the system support is that they are providing real-time solutions to production level systems. They make sure 100% availability of systems. Deploy systems in a production environment; maintain change management, coordinate other relevant teams to make sure continuous availability and standard of the systems.

As system support engineers provide support for mission-critical systems, they need to have a solid technical background to respond to any issue immediately. However, most of the fixes to those issues are repetitive. Moreover, support engineers work with the same system for a long time until the project contract is over. Such repetitive, less challenging, and long-term activities tend to demotivate system support engineers, whereas their career and technical skills tend to stagnate with time.

There are many factors to demotivate system support engineers such as "absenteeism, however, is an in-depth, there are several perspectives of both the motivation and demotivation of the small number of individuals are directly affecting the growth and revenue of the organization." Hebda et al. (2012). Motivation is not a "one-size-fits-all" endeavor Tanner (2003). It's based on the work the engineers perform, the pressure they get, and the relationship with the manager. Support engineers' target is only resolving issues for their customers rather than grasping a good understanding of the system they are proving support (Gary & Durcikova, 2014, p.1). It leads to system support engineers to become lazy. Studies elaborate that a mechanism is needed to improve their knowledge.

Most of the studies emphasize that support engineers become lazy with their tenure, and there are several personal and organizational reasons. This says that finding reasons for system engineers to become demotivated and less productive is inevitable to increase organization and personal productivity of support engineers.

1.3 Problem Statement

This research intends to identify the issues that lead system support engineers to become demotivated, lazy, and lack initiation to improve their technical and professional skills. Moreover, it is vital to find a suitable solution to overcome these as it is not productive to both the company and system support engineers. Thus, the problem that this research plans to address can be stated as; system support engineers are less competitive with the rapidly changing IT technology. Less competitiveness leads to making less innovative and productive employees to the organization.

1.4 Motivation

Many system support engineers complain that their technical competencies are lesser than other IT-related employees. During a career change, they encounter several difficulties than other IT employees. As an example, QA engineers change their career to developers easily than support engineers. It seems to support engineers' technical competency is lesser parallel to the rapidly advancing technology. Several factors influence to make support engineers demotivated. Repetitive work, automation, working in the same technology for a long time, less challenging work are some of the main factors.

1.5 Objectives

- To Identify factors affecting the low productivity of system support engineers in Sri Lanka Software Companies
- To analyze the relationship between the factors affecting low productivity of system support engineers
- To recommend solutions to improve the productivity of system support engineers in the software industry

2. LITERATURE REVIEW

2.1 Chapter Overview

The second chapter mainly describes the related present case studies to this research study. Since system support engineer concept still a growing area in the IT sector, and they fall under the category of software engineers, most of the existing literature reviews are focused on software engineers. Therefore, this Section considers only very relevant current studies.

2.2 Existing Studies

2.2.1. Roles and Responsibilities of System Support Engineers

System support needs to maintain and continuously improve implemented systems in any organization. Maintaining a critical application is a difficult task. April et al. (2005). System support engineers' role comes to picture with the beginning of the use of the business-critical applications in organizations whose core business is not related to information technology. These organizations face a very critical situation with the downtime of their systems. It can make a massive impact during the downtime of the system due to the organizations being irrelevant to IT, unavailability of experienced employees to maintain IT systems and not enough time to focus on systems as their core business is entirely different. Also, de Souza et al. (2005) mentioned that software maintenance is a necessary process to change developed IT systems according to the changes happening in the business or operations.
Software maintenance needs to satisfy two significant aspects.

1. Satisfy the support organization's customer
2. The technical aspect of the software domain (April et al.,2005,p.198)

The above clause shows that system support means not only focusing on the infrastructure of the system. It needs to focus on business processes and excellent clarity on application and system function and its domain.

Some IT organizations provide domain-led support, reduce customers' total cost of ownership, improve productivity, increase service level for end customers, and improve client productivity and more to non-IT organizations. Organizations need system support

engineers to provide these services to business-critical applications. Automation, process standardization, and analyze systems are some more improving performance activities which are working on system support engineers. To perform these tasks, system support engineers should be capable of an extensive range of technology platforms and business domains. System support engineers are to provide services such as,

- Consulting services such as populating of strategic plans for services and transition, IT service management, implement automation processes
- Execution services like incident management, problem management, change management, release support, version control, production support, middleware support, application servers and web servers, configurations and management, and enterprise and web content management
- System support engineers should have the capability to work under pressure, excellent communication skills, teamwork, innovation skills, etc. (Genpact,2018)

There are two leading roles in support employees.

1. Support managers
2. Support engineers.

Based on their role, support managers are responsible for conducting discussions and making negotiations on their team maintenance scope with the customer and priorities, preparing a budget, and implementing Service Level Agreements (SLAs). Also, support engineers are responsible for taking backups from supporting systems, system recovery activities, system administration activities, and some issues related to networking, platform and operations, and more other support services (April et al., 2005, p.200). De Souza et al. (2005) has mentioned that maintenance engineers are also responsible for problem management.

2.2.2. Efficiency and productivity of system support engineers

It is better to identify the specific actions performed by Support engineers before finding out the productivity of support engineers. Bok & Raman (2000) mentioned that productivity and effectiveness had become a crucial concern in higher management in the IT industry. Further, the study has indicated that it is a very complex activity to measure the productivity of software engineers measuring because software engineering is based on the knowledge of

employees. According to Kajko-Mattsson (2001), generally, support engineers get tickets with incidents, problems, and requests. Support engineers should recreate reported problems and perform the root cause analysis for the reported issue.

Empathy, patience, and positivity reactiveness, responsiveness are some of the essential characteristics that are expected by customers during support services. As mentioned in the salesforceDesk (2018), support employees' performance is measured by several perspectives. According to standard, response time is a critical action of support employees. El Sawy & Majchrzak (2004) has expressed that supports employees respond to their customers at "lightning speed" during technical problems. It can be over the phone, via emails or social media. Under responsiveness, first reply, the time between replies, resolution, number of replies per ticket, number of tickets resolved in a given period, resolved ticket variety, customer experience rating, response lengths and analysis, and reactiveness are the most effective factors to show up the performance of support employees. (salesforceDesk, 2018)

2.2.3. Motivation and Demotivation Vs. Productivity

Several studies identified that employees' motivation mainly affects the productivity of an organization. The software industry highly depends on the knowledge of workers. Therefore Asghar & Usman (2013) mentioned that the motivation of employees leads to the success of the project, whereas employee demotivation is the leading cause of project failures. Large companies have a responsibility to focus on individual motivation to improve innovation and productivity of technical employees. Motivational/demotivational factors are based on individuals' preferences. Das (2003) mentioned that understanding the factors individually and rewarding them according to their preference, is the most effective method to motivate technical human resources. Maswabi & Qing (2017) says that individual demotivation is impacted by psychological, physical health, and organizational effectiveness and efficiency. Maswabi & Qing (2017) identified that demotivated workers are more likely to be unhealthy, less productive, and concentrating less on their work.

Furthermore, Rehman et al. (2011) also stated that productivity depends on the motivation of individual software engineers. Also, they look at motivating software engineering differently. According to the study, software engineering managers are not much good at motivating their

subordinates since they are from a technical background, and they haven't been trained at managing people.

There is a significant correlation between reward and employee satisfaction and motivation. Same as the study found that there is a meaningful association among employee gratitude and motivation. An essential part of this research is that they have stated that if an employee is offered with a reward or recognition then employee change to work motivated and satisfied (Ali & Ahamad,2009,p.270)

Some articles elaborate on factors that lead to demotivate Software industry employees. This research is to "find the factors affecting to demotivate system support engineers." System support engineers are also from a background of technical knowledge and working as knowledge workers; this study is analyzed on technical employees demotivation factors and extensively elaborates them with the matching factors. According to Asghar & Usman (2013) and Hebda et al. (2012), demotivational factors are based on two main categories, called "Extrinsic" and "Intrinsic." Main extrinsic factors are cultural dimensions, poor management, company culture, processes, business/economic environment. Intrinsic factors are characteristics of engineers. As explained by Tanner (2003), motivation is not a "one-size-fits-all" endeavour.

Moreover, only a very less number of researches could be found in web sites, and articles related to IT support engineers. According to the study of Das (2003), several activities are assigned to technical support engineers over other software engineers. Technical support engineers are experts in the designated work area. They always work on assigned work rather than on new issues or failures. The researcher explains that technical support personnel keeping ownership of the problem. There are three ways to resolve an issue for technical support engineers:

Locate – Using the repository such as a "Frequently ask questions (FAQs)" or list of design imitations. They have fewer modifications.

Adapt – Similar problems which have resolved in the past. Using the experience, analyze the raised issue. Sometimes use some form of "Organizational Memory."

Generate – Undertake to reason from the principles of operations underlying the artifacts.

This research has clearly defined that the measurement of technical support personnel is calculated by the issues handled and how long it has taken to resolve each issue. Therefore, many times, these employees are willing to solve the repetitive problems with less challenging. Then they can perform well inside the organization. It causes to reduce analytical skills and try to depend on the stored data in a central location or always apply primary principle artefacts. According to the literature, technical support people are good at repetitive tasks rather than problem-solving with a good understanding. The repetitive tasks will reduce the problem-solving time duration and increases customer satisfaction for the repetitive issue. Then, they become less competent to resolve the issue when new issues arise. Technical support employees use databases, archives, documentation, and manuals to store data physically. According to his research, if a person is an expert on problem-solving, that person can navigate the rich information efficiently. Uses of knowledge repositories are made less competent and less technically updated support employees to the organization. This situation leads to producing demotivated support employees. Sainter et al. (2000) expressed that knowledge management systems give short-term solutions, and it generates long-term issue because it loses underutilized knowledge.

(MetricNet, 2015) the site provides some matrices to measure support performance such as:

Customer satisfaction – customer interviews, sending questioners, phone conversations are some methods to measure the support performance of employees.

Use scorecards – in a given period, measure the performance using scorecards.

Think ahead (2018) the site mentioned that scorecard is a method to improve the practice of employees' performance as it measures several aspects of performance criteria.

Gary and Durcikova (2015) mentioned that most of the technical supports environments are sue knowledge repositories they had clearly explained how knowledge repository helps to technical support engineers and what are the disadvantages they are facing. Knowledge repositories improving the efficiency of support engineers by getting engage in expertise during problem-solving, able to use prior knowledge. On the other hand, it has mentioned the

disadvantages faced by the technical support employees such as, if a new issue raises support engineer will take more time to resolve as knowledge repositories free technical support employees analytics skills, it reduces employees cognitive skills, confidence to resolve issues, less learning-oriented environment. Those systems are making people with depending on others knowledge and skills. Whenever these employees face a new issue, they are unable to handle the problem and taking more time to resolve. It leads to customer dissatisfaction, and an escalation happens. Because of that, employees become demotivate of the job role. Though the knowledge repositories are efficient and easy, it makes less competent, less confident, less hand on experienced, less quick learning technical support employees to the organization as well as to the society.

Reukauf (2018) mentioned that there is an association between employee turnover and employee satisfaction or dissatisfaction. Demotivated employees are willing to change the current working environment, and it leads to turning over of an organization. The study has found some factors to demotivate and job turnover of technical support personals like lack of human resource skills, lack of team building skills, individual recognition, not a good understanding of what is the expectation of the project and where the technical person needs to support.

Michael Page International Recruitment Limited (2018), the website mentioned some reasons for employee demotivation. It's crucial to identify and respond to employees requirements, all over the company. As an employer, it is better to identify signs of demotivation in early stages and getting necessary action it helps to encourage employees. This site identified and explained seven common demotivation factors of employees. Lack of career vision is one of the most important factors for employee demotivation. Majority of employees are willing to have a clear career objective in place. Employees are believed that clear career objects help to their career progression for them within their organization. If employees don't have clear career objectives, make demotivated employees to the organization. The second demotivation factor is job insecurity. Lack of career vision gives employees to sense of job insecurity. The third demotivation factor is Feeling under-valued. The under-valued explains that if employees feel that their efforts and commitments are not recognized or appreciated, they'll start to feel demotivated. Next demotivation factor is no development opportunities.

Employees are willing to improve their skills and knowledge. If employees are not getting a chance to enhance their experience and skills with the rapidly changing industrial environment, then they are getting demotivated. Poor leadership is one of another factor to be demotivating employees. The sixth factor is conflicts inside the team. This site says that debates are often useful. Disputes between team members, intimidation, or bullying are not good factors in an organization. The final mentioned factor is Unrealistic workload to demotivate employees. Impossible workload not varied enough work also helps to demotivation factor to employees

System support engineers are even falling under the software engineer's category. According to Asghar & Usman (2013), there are several demotivation factors identified in the literature. This study focus on the software engineers and all the identified factors are not related to support engineers this Section has mentioned the most relevant factors such as Poor communication, less collaboration within team members, impractical goals, poor cultural fit, poor management support, unfair reward system, non-interesting work, personal preferences, Stress are the motivational factors found in the literature.

According to Upgrad.com site, support engineer job is a tiring field with long working hours and rotational shifts. This site express that supports engineers are trying to get out from the support job as not because of the career growth, but because of the restless work environment and less work-life balance. As the site shows that changing career path after sometime is tricky because if a development path is required more technical knowledge if a Project management role then support engineers need to improve managerial skills.

Furthermore, Rehman at el (2011) has identified that below factors also made employees demotivated: lack of promotional opportunities, unreasonable payments, less transparent rewarding system, and motivators are recognition, technically challenging work, job insecurity, and feedback.

The final focus is of this research is to publish relevant motivation factors related to support engineers because there are minimal studies on support engineers. Also, some of the factors could be related to Asian countries that not associated with European countries. Therefore, before the empirical study starts, plan to have a general idea of some software engineering

motivators as well. Tanner (2003) has mentioned that engineers are different from other occupations, and therefore, they require specific techniques to motivate them. Provide continual learning environment, Accomplishment, and recognition, team working, and management is identified factors in the study.

Many studies mentioned that managers also one of the demotivation or motivation factor of software engineers. Kalliamvakou at el (2017) has expressed that great managers positively impact on software engineers' motivation. These studies represent those great managers promote employees somewhat and make recognition of individual employees.

Hebda et al. (2012) tried to find support personal motivational factors in their study, and they have identified self-motivation, company structure, and company culture, reward, and recognition.

2.3 Factors affecting the research problem

The individual performances are directly or indirectly affecting to profitability and growth of an organization. Beneath et al. (2012) mentioned that some organizations use motivational mechanisms to motivate their employees for the future growth of the organization. However, most of the employees can be demotivated for several reasons. These motivational factors can be differing from one person to the other. Employees' demotivation is one of the factor negative impacts on an organization. So, it is crucial to identify the demotivation factors which are affecting employees' productivity.

Concerning existing studies, there are several demotivation factors identified in many angles. Asghar & Usman (2013) has identified below factors which are negatively impacting on motivation on employees.

- Poor working environment
- Poor communication
- Lack of relationship opportunities
- Unrealistic goals

Moreover, Hebda et al. (2012) identified below demotivation factors and subfactors, which are affecting technical visionaries productivity.

Table 2.1 Demotivation factors and subfactors by Hebda et al. (2012)

Demotivation Factors	Subfactors
Poor Management	Lack of open-ended time for visionaries Dictator manager Unsupportive manager Meddling manager A manager that dismisses ideas
Company Structure	Bureaucracy Organizational changes that did not work Poor structures
Company Culture	Company culture Poor metrics / company vision Short-term focus
Awards, Rewards, Recognition	Promotion limitations Rewarding the wrong people Rewarding the wrong thing The reward is too small Rewarding everyone the same Taking away previous awards
Process	No process Thrown into an administrative role Bad customers Bad process Not being able to follow product to market Bad vendors
External (to the company)	Business / economic environment

Gary & Durcikova (2014) defined support workers as technical support is a crucial business factor in computer hardware and software related organizations. Also, support personal getting trouble with SLAs and analyzing issues. Therefore, most of the support organizations are using knowledge repositories to store new knowledge, and new issues team members are facing. The same knowledge repositories sometimes make support engineers demotivate. The knowledge repositories reduce employee cognitive skills, confidence to resolve issues, less learning-oriented environment. If any team member depending on knowledge repository may dissatisfy with a situation, a new issue arises.

According to Dobre (2013), managers' should have a responsibility to reduce the dissatisfaction of employees. Dobre (2013) has mentioned that dissatisfy factors are:

- Working conditions
- Salary
- Supervision
- Relationship with colleagues

Also, Westlund & Hannon (2008) stated that as per the Herzberg theory job satisfaction happens due to extrinsic factors such as,

- Supervision
- Pay
- Operating conditions
- Coworkers

However, to get rid of employee demotivation, many organizations use several motivation mechanisms Hebda et al. (2012). This study provided motivators with two perceptions of Technical Managers and HR. Since employee motivation should be an essential factor to be improving the productivity of an organization.

Table 2.2: Motivation factors and subfactors by Hebda et al. (2012)

Motivator factors	Motivator subfactors
Intrinsic Motivation	See idea become reality Trade Seminars Customer feedback Outside peer interaction
Things Managers Can Do	Time Acceptance of failure Interest and appreciation Leadership Provide challenge Mentoring Listening
Company Structure	Dual ladder Fellow program Proper understanding of individuals
Company Culture	Facilitate an environment that helps to create new things Team collaboration Training
Awards, Rewards, Recognition	Innovation awards Money Spontaneous bonus or incentive General recognition Peer recognition Informal awards

Shahbaz et al. (2017) have identified some motivational factors align with software developers.

- Rewards and incentives
- Management supportive roles
- Career path
- Better working environment
- Technically challenging work
- Verity of work
- Feedback
- Recognition
- Eliminate politics
- Management contribution
- Sense of responsibility
- Project ownership
- Equity Work balance
- Autonomy

2.4 Existing case studies

2.4.1. Software Maintenance engineer activities and productivity measurement

SM[mm] April et al. (2005) has been presented in Figure 2.1 to provide an idea of daily activities which maintainers are involving. Figure 2.2 has mentioned below interfaces uses in a usual software maintenance organizational perspective.

- Customer and Users of software maintenance
- Upfront maintenance and help desk
- Computer operation department
- Developers
- Suppliers

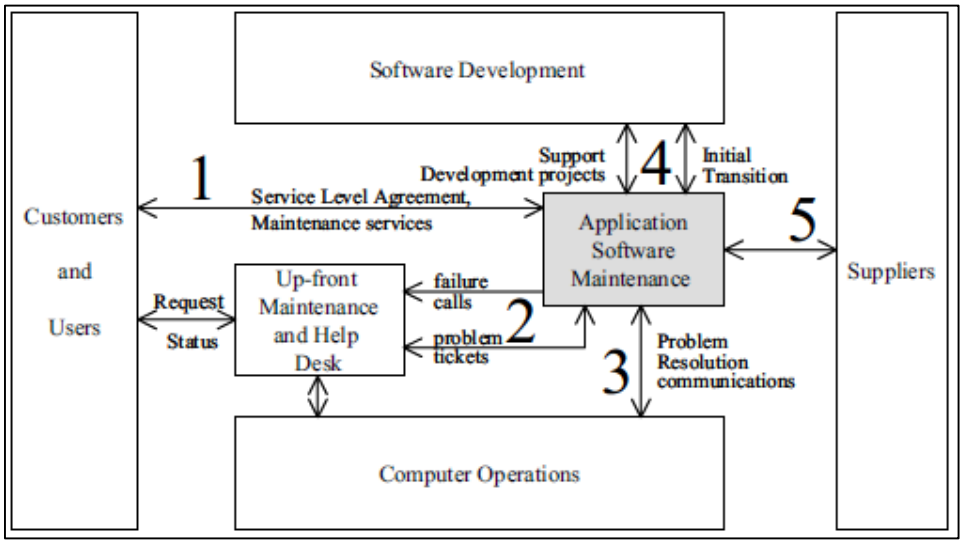

Figure 2.1: Daily activities of Maintainers (Source: Software Maintenance Maturity Model (SMmm): the software maintenance process model)

The same study by April et al. (2005) introduced Figure 2.1 model using many existing models such as CMMi, ISO/IEC14764, ISO/IEC12207, IEEE 1219, and SWEBOK. The SM^{mm} is developed on the customer perspective. SM^{mm} model can be used to understand the capability of software maintenance provider from the customer perspective. The SM^{mm} model considers not only activities involving developers. It includes maintenance activities as well.

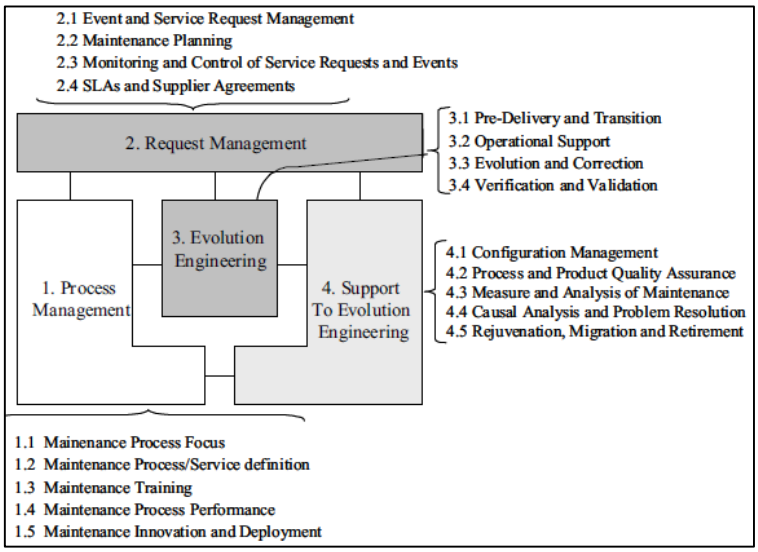

Figure 2.2: SMmm process and KPAs for maintainers(Source: Software Maintenance Maturity Model (SMmm): the software maintenance process model)

Advantage of Figure 2.2 mentioned model is, not has the CMMi model this consider the factors which are unique to software maintainers. The SMmm model suggested another practice, such as:

- Event, service request management and SLA
- Maintenance planning activities specific to maintainers (version, SLA, impact analysis);
- Software transition, Operational support and Problem resolution process; and
- Software rejuvenation, Conversion, and Retirement. (April et al., 2005, p.209)

The thesis is considering system support engineers. Figure 2.1 explained regarding maintenance activities which are more relates to support operations. Figure 2.2 mentioned the comprehensive activities which should support engineers to be performed.

2.4.2. Motivation factors and job satisfaction

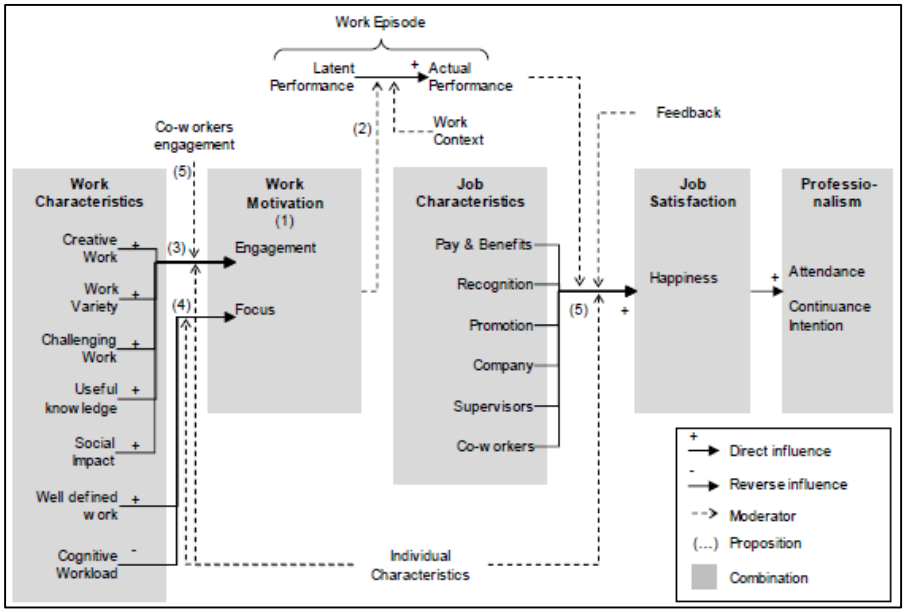

Figure 2.3: Model of work motivation and job satisfaction (Source: Motivation and Satisfaction of Software Motivation and Satisfaction of Software Motivation and Satisfaction of Software Engineers)

Franca, Da Silva, & Sharp (1996) has introduced a model called the Theory of Motivation and Satisfaction of software Engineers (TMS-SE). This model (Figure 2.3) tries to explain that motivation to work and satisfaction of the job are two separate areas. The model elaborates on how workplace factors effectively contribute to an engineer's satisfaction and

which factors encourage individual performance through work motivation. A boundary of the TMS-SE is that it does not make a clear explanation to identify the workplace factors involving work motivation and high performance. The reason is for selecting this model to identify the motivational factors of software engineers.

2.4.3. Motivational and De-Motivational factors for developers

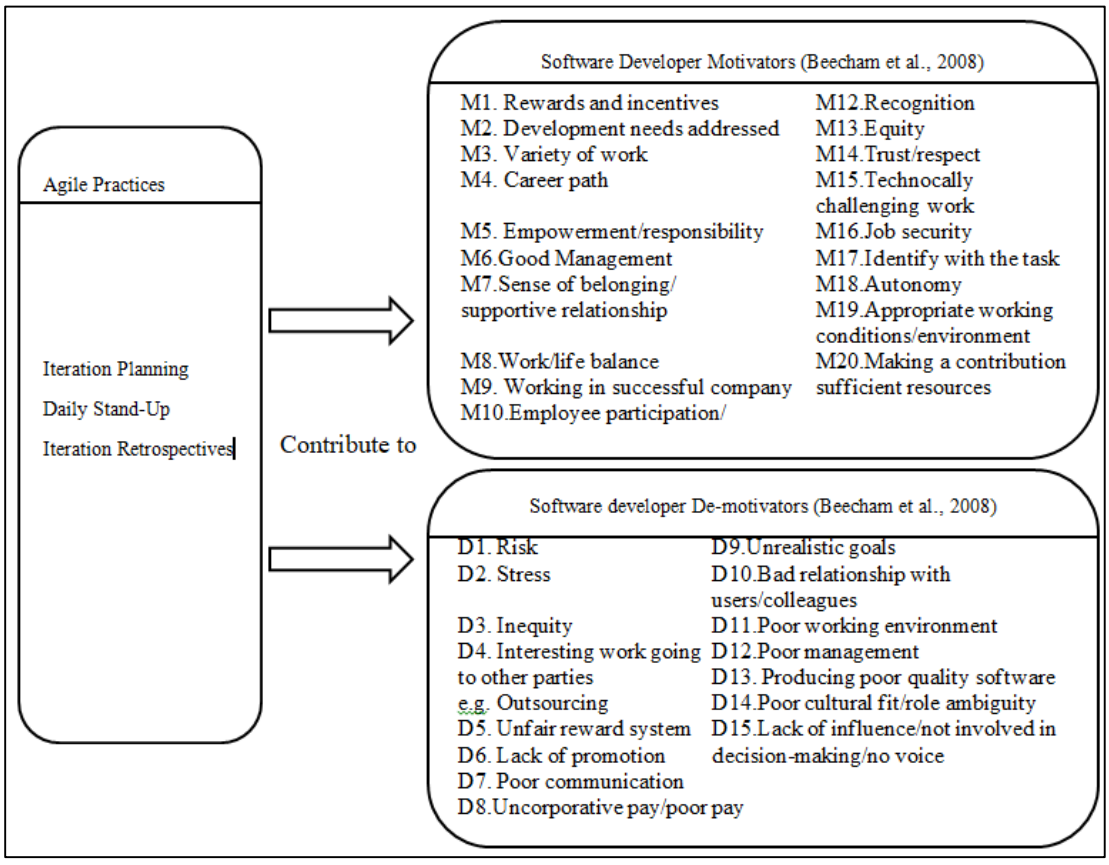

Figure 2.4: List of motivation and de-motivation factors (Source: Using Agile Practices to Influence Motivation within IT Project Teams)

The model specifies the motivational and demotivation factors of software developers with an agile process. System support engineers not always use agile practices, and some of Figure 2.4 identified factors are not related to system support engineers. Advantage of selecting this model is helping to identify motivational and demotivation factors which can be related to system support engineers. The disadvantage of this model is, it has identified factors only for developers in the IT industry. Also, the model has defined how an agile process involves motivating and demotivating developers in the IT industry.

2.5 Evaluation of related work

Table 2.3: Summary of existing studies

Related Work	Factor Considered	Research Methodology	Advantages	Disadvantages
Asghar I., Usman. M., 2013	Lack of career path opportunity Poor communication Poor working environment Lack of relationship opportunities	Interviews and questioners used to gather data Results are collected using statistical tool SPSS	Most of the studies are based on European countries. The research is conducted for Pakistan.	A large number of people used for the survey
Tanner F.R.,2003	**Motivation factors** Engineering Work - challenging projects, chance to study Accomplishment and Recognition Education and Training - engineers must update their body of knowledge in their chosen field Hierarchy of Management Problem Solving Compensation	Paper-based research. This paper attempts to present "Motivational toolbox" for managers	Technical engineers motivational factors directly identify this	The paper-based research using motivational theories.
Hebda, J.M. et al. 2012	**Demotivation factors** Technical Managers Process Poor Management Company Structure Company Culture Less Recognition **Motivational Factors** Create knowledge Encourage to innovate See idea become reality Trade Seminars Corporate rewards and recognition	A team-based followed initial coding coding and analysis process to ensure that the initial categorization of the statements were correct, identify themes and subthemes across the data, and to bring additional structure to the individual statements. KM – Method of qualitative cluster analysis Interview-based research	This research considered the sample as the technical visionaries and technical managers, which is more valid to this context	This research is applicable for technical visionaries in large, mature firms
Das, A.,2003	**Demotivation factors** Use repositories for frequent issues rather than use knowledge Adaptability with long term working with the same system **performance of technical support work** Escalations Problem-Solving Tasks Resolution time	Qualitative research Categorical Log-Linear Modeling Categorical nature of the variables, they used hierarchical log-linear analysis to assess the joint impact of attributes of the Technical support situation on productivity.	System support engineers also having resolution time to resolve problems, log in to calls which are partly related to this research.	This research was done only for the level I support people.

Table 2.4: Most considerable demotivation factors from existing studies

Related Work	Recognition	Poor Management	Less learning environments	Promotions/ Rewards	Company culture/structure	Less challenging work	Knowledge Repertory
Hebda et al,2012	X	X		X	X		
Das,2003			X			X	X
Gray & Durcikova			X			X	X
Shahbaz et al.,2017		X		X		X	
Dobre,2013	X	X	X		X		
Asghar & Usman,2013		X	X		X		

Table 2.4 considers the most significant demotivation factors from existing studies. Table 2.4 only extracted factors which are relating to the support engineers from several factors. Some of the factors rejected since they are exclusively associated with software engineers, quality assurance engineers, etc.

e.g.:

From selected factors, Poor Management and less learning environment are mostly effecting for employee demotivation, as mentioned in existing studies. Poor Management is influencing to employee turnover, less productivity, etc. This factor is common for all software engineers, including support engineers.

Table 2.5: Most considerable motivation factors from existing studies

Related Work	Good management	Encourage to innovate	Learning opportunities	Rewards and Recognition	Challenging work
Hebda et al,2012	X	X	X	X	
Dobre,2013	X		X	X	X
Tanner,2003	X		X	X	X
Franca & Silva,2009			X	X	
Markes,2006	X		X		

Table 2.5 considers the most considerable motivational factors from existing studies. Proper management, Learning opportunities, Rewards, and recognition are the most considerable motivational factors identified by existing studies.

2.6 Testing and Analysis approaches

2.6.1. The Pearson correlation coefficient

The current research gain as the outcome: Measuring different job satisfaction aspects are the most considerable relationship to software developer turnover intentions. Used Pearson correlation to identify factors of job satisfaction that are most correlated with software developer turnover intention. The Pearson correlation is used to determine the negative bivariate correlation between the dependent variable and each of the defined job satisfaction independent variables. This research used a negative correlation between dependent and independent variables. Negative correlation coefficients indicate during one variable increases, and the other variable decreases. The reason to select this test is for the research is to identify the correlation between the system support engineer demotivation and tenure.

2.6.2. Cronbach's α method

Cronbach's α method is used to check internal consistency. The research initially used Valance scale and removed due to low item difficulty and internal consistency. But Cronbach's helps to found out less item's internal consistency.

The Cronbach's analysis is planning to use for this research as well. The research is going to be quantitative research and planning to use the same method to analyze the study. The advantage is of this research is can be used for quantitative analysis and measure the internal consistency of the study.

2.6.3. Team-based coding and analysis process and KJ-Method

First, categorized data into two sets called Motivators and demotivators. Then added coding tags to each statement. As a third step, they have separated into three sections for both motivators and demotivators. The statement which cannot be categorized has added without category tags. Then they sorted and all statements printed on 3" by 5" cards. These came under the team-based coding and analysis process. The value of this analysis was to ensure initial categorization of the statements was correct, identify themes across data.

The second set of analysis, they used KJ-Method of qualitative analysis to create an affinity diagram. Created a tree chart of coded data rather than each coder categorization individually. Then statements added into preselected themes in a top-down coding procedure. The KJ method is a

An affinity diagram used to organize ideas and data. They have used this method to create qualitative cluster analysis to create first an affinity diagram. Then, the tree chart of coded data containing all motivators. JK-Methods is a bottom-up and team-based approach to develop categories and find themes and sub-themes from the selected data.

2.7 Limitation in existing work and new challenges

2.7.1. Limitations in existing work

Among the case studies, one of the most important analyzes to compare motivating and demotivating factors of technical visionaries in large mutual corporations. This case study couldn't apply to the mall or stat up companies: the study employee motivation and organizational performance. Review of Applied Socio-Economic Research identified limitation is concerned the overall motivation factors and not considered individual expectations of participants. The Role of Knowledge Repositories in Technical Support Environments: Speed versus Learning in User Performance. According to the Journal of Management Information Systems study, all respondents of the small organizations are using the same repository, and it is an issue to perform a survey.

According to Sach, Sharp & Petre (2011) tried to find a perception of factors in motivation, and their study limitations are:

- A software engineer who was involved was in one organization. Software engineer community is a broader community not restricted to one organization's perception.
- A fewer number of participants involved in the study, and because of the less participant, the gathers data amount is low from one organization. It is a limitation to identify a broader range of factors is engaging.

2.7.2. New challenges

It is essential to study how demotivation factors affecting system support engineers who are working in the small, medium, and start-up organizations. It might be different factors may cause to demotivate employees in the above organizations.

System support engineer role is still not having much recognition in Asian countries. Therefore, it is valuable to do new studies in Asian countries.

2.8 Discussion

System support engineers are working in business-critical situations with under stress. Most of them are work for 24*7 shifts according to the roster. Work in long working hours with less work-life balance are the most common reasons to change career path from a support engineer to other career paths. Other than that most critical reflect of several studies are software engineers become demotivate in their career. There are two main factors to demotivate system support engineers. The two factors are External factors and internal factors.

Internal factors to demotivate support engineers are characteristics of engineers such as communication skills, patience, empathy, attitudes, less security of a job, no clear idea of career path.

External factors are to be demotivated support engineers are less challenging work, work in repetitive tasks, knowledge base systems, less rewarding, less recognition and personal bias, etc. knowledge base systems make system support engineers work easy and it direct employees to be lazy. Repetitive work is a typical situation for all humanity to make lazy. Therefore, this is a normal situation system engineers to be demotivated.

Other main reasons to demotivate employees are managers not use a standard criterion to measure system support engineers. System support engineers work performance measuring is not easier than developers or quality assurance engineers. The main reason is system support is based on the qualitative factors of system support engineers like communication, customer feedbacks, quality of work, etc. Numbers of resolving tickets are one of the leading method managers used to measure the performance of system support engineers. But it is not a suitable method if one team handling different small system and each employee was responsible for each system. Because all the systems do not behave similarly.

3. METHODOLOGY

3.1 Overview

In the third chapter on methods, presents the conceptual framework, formulated hypotheses, and methods of data collection, population and Sampling and approach adopted.

The research methodology comprises two phases. In the first, exploratory phase, interviewed 25 system support engineers and managers — this interview considered as my pilot survey for the research. The second phase of this research is the confirmatory phase, developed a set of questionnaire and shared with a large collection of system support engineers and managers in the IT industry.

3.2 Research Design

Initially, referred existing studies and selected demotivation factors related to system support engineers. Then performed a pilot survey on an interview base and finalized the factors to be used for the final study. Later, create the final survey to share among system support engineers in Sri Lanka. The study is a survey based research which has shared via online and based on the security reasons some employees got printouts for the survey. Make sure to keep both online and printed paper questions and requirements are similar.

This Section includes the conceptual framework used to implement the questionnaire and relationship between dependent and independent variables.

3.2.1. Conceptual Framework

The theoretical framework is what are your beliefs and published researches are interrelated to each other and how they are related to each other

A theoretical framework help to identify the relationship among variables considered as necessary to the problem. Sekaran & Bougie (2006)

Figure 3.1. is Illustrated the conceptual framework for the current study.

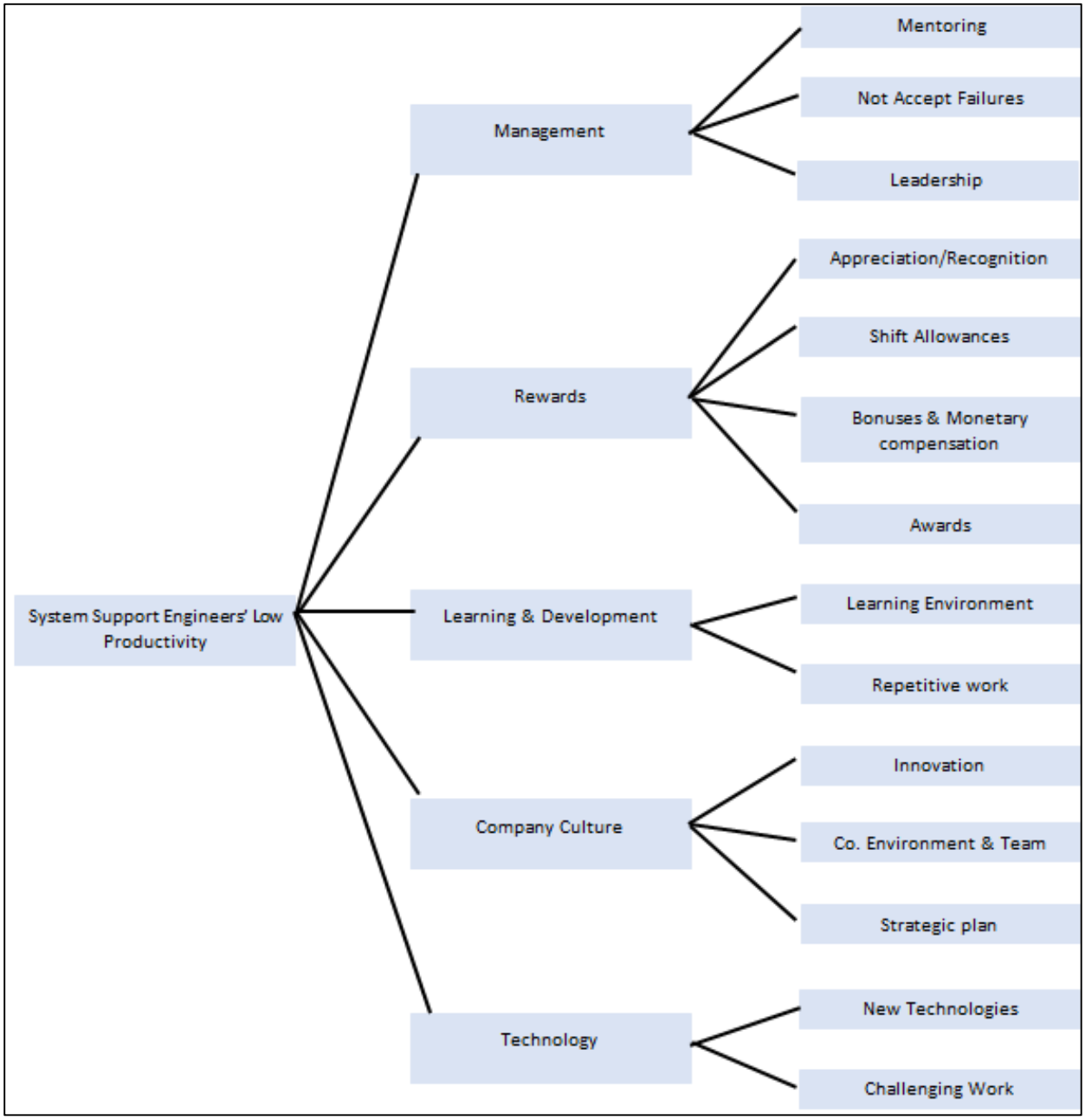

Figure 3.1: Conceptual framework

The conceptual framework presents five independent factors, and each independent factor has subfactors, which were identified from the pilot survey.

3.2.2. Variables on the relationship

Table 3.1: Relationship between dependent and independent factors

Dependent Factor	Independent Factors	Subfactors for independent factors
System Support Engineers' low productivity	Management	Mentoring Not Accept Failures Leadership
	Rewards	Appreciation/Recognition Shift Allowances Bonuses/Monetary Compensation Awards
	Learning and Development	Learning Environment Repetitive Work
	Company Culture	Innovation Company Environment & Team Strategic Plan
	Technology	New Technology Challenging Work

System Support Engineers' low productivity is the dependent variable of the research study, which varies based on the response in independent variables. The final aim is to identify whether independent factors are negatively affecting the motivation and productivity of the system support engineers, and this will not change throughout the study.

The independent factors are identified from existing literature sources and observations. Table 3.1 represents the outcome of independent variables from the pilot survey. These factors have a direct impact on the dependent factor.

3.3 Data Collection Methods

3.3.1. Primary Data

The used primary data collection method is for this research is a quantitative method. As a quantitative method, this research has used the questionnaire-based survey through online and printed papers. Printed papers used because of security standard maintaining in some IT organization for their client satisfaction and data security.

The target population of this research is the system support engineers work in IT industry Sri Lanka. Since the population size is large and they are distributed within the country, therefore the most appropriate technique is a quantitative method for this research. Some of the motivation of software engineer related researches Franca, Da Silva (2009) is used to follow the quantitative approach and questionnaire to gather dataSome of the motivation of software engineer related researches Franca, Da Silva (2009) is used to follow the quantitative approach and questionnaire to gather data. Considering these situations selected quantitative method as a suitable method for this study. This research can be carried out for a selected sample of system support engineers based on stratified random sampling — Online based questionnaire used as the data collecting method.

There are several reasons to select a questionnaire for this research; some people might not give honest response and ease of distribution to several system engineers within several organizations. Online based survey and printed based questionnaire used for data collection. Online survey used to share with most of the organizations and based on the security purposes that are followed by some IT organization it is restricted to allow online questionnaires and therefore used paper-based question distribution with among them. Some questions are open-ended, and all other questions are to find the research problem in this study. For all survey, related questions used fie point Likert scale method. Likert scale is more appropriate to the answers more reliable, and it is easy to access employees' feeling about something

This study is related to employees feeling and perception, and if this research was done as an interview, it depends on the employee's mind and workload in the project. As an example, if the employee with an angry mood in the project before the interview, it influences to negative results of the study. Also, this questionnaire included related to team leads and the managers. Therefore, they are not willing to provide answers face to face questions. So, these questions not included the name or organization as well.

3.3.2. Secondary Data

Primary data are the facts found from existing research studies, journals, web sites, and books. Europeans wrote several studies. Therefore, they were needed to filter and create a questionnaire relevant to Sri Lankan system support engineers. These existing studies were related to software engineers, and data extract relates to system support engineers.

3.4 Sampling Design

3.4.1. Target Population

The target population of this was the Software professionals under system support professionals who are working in the software organizations in Sri Lanka.

Sample of the research was the software professionals those who are fallen to system support category and working in the small, medium, and large scale software organizations in Sri Lanka. All selected software professionals those who know system support and maintenance. It is a must to study the relationship between system support engineer career and demotivation; the respondent should have at least basic knowledge about system support activities and maintenance activities. The research study is an in-depth study of identifying factors which leads to demotivate and less productive system support engineers in Sri Lanka. Therefore, data collected from selected IT organizations which have a support platform. To select a list of organizations, convenient sampling technique used, based upon the availability of support projects and convenience in access to the organizations for data collections such as through contacts in organizations

3.4.2. Sampling Size

System support engineers are strata of software engineers in the IT industry. Then using the National ICT workforce report 2013, sample size calculates using the “openepi” site.

URL: https://www.openepi.com/Proportion/Proportion.htm

Overall IT employees: 75107

Technical support engineers: 12%

= 75107 * 12/100 = 9013

Sample size: =

This study uses the confident level: 95%

Therefore, sample size: 369

The questionnaire should share with technical support engineers and need to get responses from the sample size 369 for this study.

3.4.3. Sampling Elements

The research has used disproportionate stratified random sampling as the sampling method since system support engineers are located in several IT organizations. Therefore, according to the distribution of the population, this method is the best option for this study.

3.5 Research Instruments

3.5.1. Distribution Methods

Questionnaire distribution has done through online and printed papers. For online survey using Google fprm and remaining are printed documents amend in Annex B. Once collected all printed papers and they also included to the online survey since it is easy to perform the data analysis.

3.5.2. Questionnaire Design

With previously identified factors, a questionnaire created for the research to identify factors to demotivate and to less productive system support engineers. The survey produced considering more perspectives such as activities related to system support engineers, their experience with system support activities, factors can influence the low productivity or outcome of system support engineers in the IT industry. The questionnaire included polar questions and five-point Likert scale questions plus based on the relativity.

Additionally, questionnaire included demographic questions such as experience.

Table 3.2: Questionnaire Distribution

Question	Questioner Distribution														
	System Support	Management			Rewards			L & D		Company Culture			Technology	
		Mentoring	Not Accept	Leadershi	Appreciation/ Recogniti	Shift allowance	Compensation	Learning Env.	Repetitive Work	Innovation	Co. Environment &	Strategic Plan	New Technology	Challenging Work
Since how many years you have been working in the current organization?	X													
How many years have you been working as a system support engineer?	X													
I am the team lead of my project team:	X													
Why would you have interested in system support area?	X													
Does demotivation affect performance at the place of work?	X													
I am always adhering to Service Level Agreement agreed by management and the client?	X													
I always follow the ITIL process to provide better support to our customers	X													
Make sure my supporting system availability is 100%, and if in case I will work any time during the day. (On a desk or on-call support)	X													
I like to work on a shift basis in my current project						X								
My productivity makes less if I have assigned to a team to work on a shift basis without getting any allowances						X								
I am not satisfied if I do not get monetary incentives quarterly/yearly/career path basis.							X							
I get demotivated if management selecting employees without a proper transparency for award sermonizes:					X									
I tend to less productive on my work if my performance appraisal is less transparent during my manager's feedback:					X									
I think our management and leads having less ability to recognize our individual and teamwork					X									

I think less recognition of my management is impacting the productivity of my work					X									
I would like public appreciation than private appreciation within the team and management					X									
I like to get written appreciation/recognition than verbal appreciation					X									
The primary value of recognition is an acknowledgment of performance by management. My manager does not appreciate my team members or my good job					X									
Not getting chances to participate training is affecting my motivation of work within the team								X						
I'm not happy to work in the same project and involve in same work routing for a longer period, and it leads to reduce my performance (e.g., working for more than 1year in the same project)									X					
I am tending to demotivate if I have assigned to work in the same technology where I cannot grab new technical knowledge													X	
I get demotivated if I do not get a chance to involve with technically challenging work/issues.														X
If I am not getting, chances to work with difficult implementations/high priority issues in my own make myself demotivated on my work														X
I feel bored if I'm not getting chances to apply my knowledge within my project														X
My manager is not giving a chance to express my ideas/problems with him/her during my work		X												
Our leadership is not good at guiding and mentoring team members to increase the productivity of teammates		X												
My manager does not accept our human failures, and it makes me demotivated			X											
I think poor management leads to demotivate employees of a project				X										

I get a bad impression on my manager when he/she is failed to guide and to lead us during an urgent/difficult issue resolving				X										
I get demotivated if my manager not trust myself and my team and not happy to assign challenging work and it makes demotivation on team members/myself				X										
I am feeling despair if I am not getting support to do innovation within the organization										X				
As an individual employee, I'm not happy to work in a team if my team members are not collaborating each other											X			
I get demotivated with my individual and teamwork, if the co-workers having poor relationship											X			
I am not willing to work in a company if the company has not a stabilized process for employee development												X		
I am not like to work in an organization if they do not have a clear strategic plan for company growth												X		

3.5.3. Pilot Test

Pilot testing is used to finalize factors identified from existing research papers, websites, and beliefs from system support engineers and manages. In order to complete factors, this research has performed an interview with 25 sets of system support engineers and system support project managers. The interview helps to remove and add new factors to the final survey. As a result, some of the factors that exist in research papers are removed for the final survey. As an example, whether knowledge repositories are involved in demotivation of system engineers IT industry in Sri Lanka

3.5.4. Summary of Questionnaire

There are 35 questions in the questionnaire list. This questionnaire included open-ended questions such as working experience and closed-ended questions to find out the factors and affecting the less productivity of system support engineers. Questionnaire divided into six sections. One section is for general questions and the other five sections based on the main factors (Management, research, and Development, Rewarding, Company Culture and Technology) selected for this research.

3.5.5. Detailed Background of the Questionnaire Structure

As in Section, 3.2, there are 35 questions, and they are categorized into separate sections.

Table 3.3: Questionnaire Structure

Factor	Sub factors	Number of questions
General questions	-	8
Management	Mentoring	2
	Not Accept Failure	1
	Leadership	3
Rewards	Appreciation/Recognition	7
	Shift allowance	2
	Compensation	1
Learning and & Development	Learning Environment	1
	Repetitive Work	1
Company Culture	Innovation	1
	Co. Environment & Team	2
	Strategic Plan	2
Technology	New Technology	1
	Challenging Work	3

3.6 Hypotheses Development

Populated hypotheses to find out whether the theorized conceptual research framework is valid. The study is analyzing the hypotheses; it is expected that a solution can find out to rectify the conflicts encountered if any:

$H_{A:}$ Alternate Hypothesis H_0: Null Hypothesis

Hypothesis 1

$H1_A$: System support engineers get demotivated and less productive by poor management of the manager

$H1_0$: Poor management of manager has no impact on system support engineers less productivity being demotivated

Hypothesis 2

$H2_A$: System support engineers decreases their productivity and demotivation him/herself by not getting a better reward system in the organization

$H2_0$: Not getting a better reward system in the organization has no impact on system support engineers less productivity being demotivated

Hypothesis 3

$H3_A$: System support engineers will decrease their productivity and get demotivated him/her by less learning and development environment

$H3_0$: Less learning and development environment has no impact on system support engineers less productivity being demotivated

Hypothesis 4

$H4_A$: Weak company culture leads to demotivation and less productivity of system support engineers in an organization

$H4_0$: Weak company culture has no impact on system support engineers less productivity being demotivated.

Hypothesis 5

$H5_A$: Not having chances to grab new technology make system support engineers make less Productive because of him/her demotivation

$H5_0$: Not having opportunities to grasp new technology has no impact on system support engineers less productivity being demotivated

3.7 Research Methodology Mapping with the Research Objectives

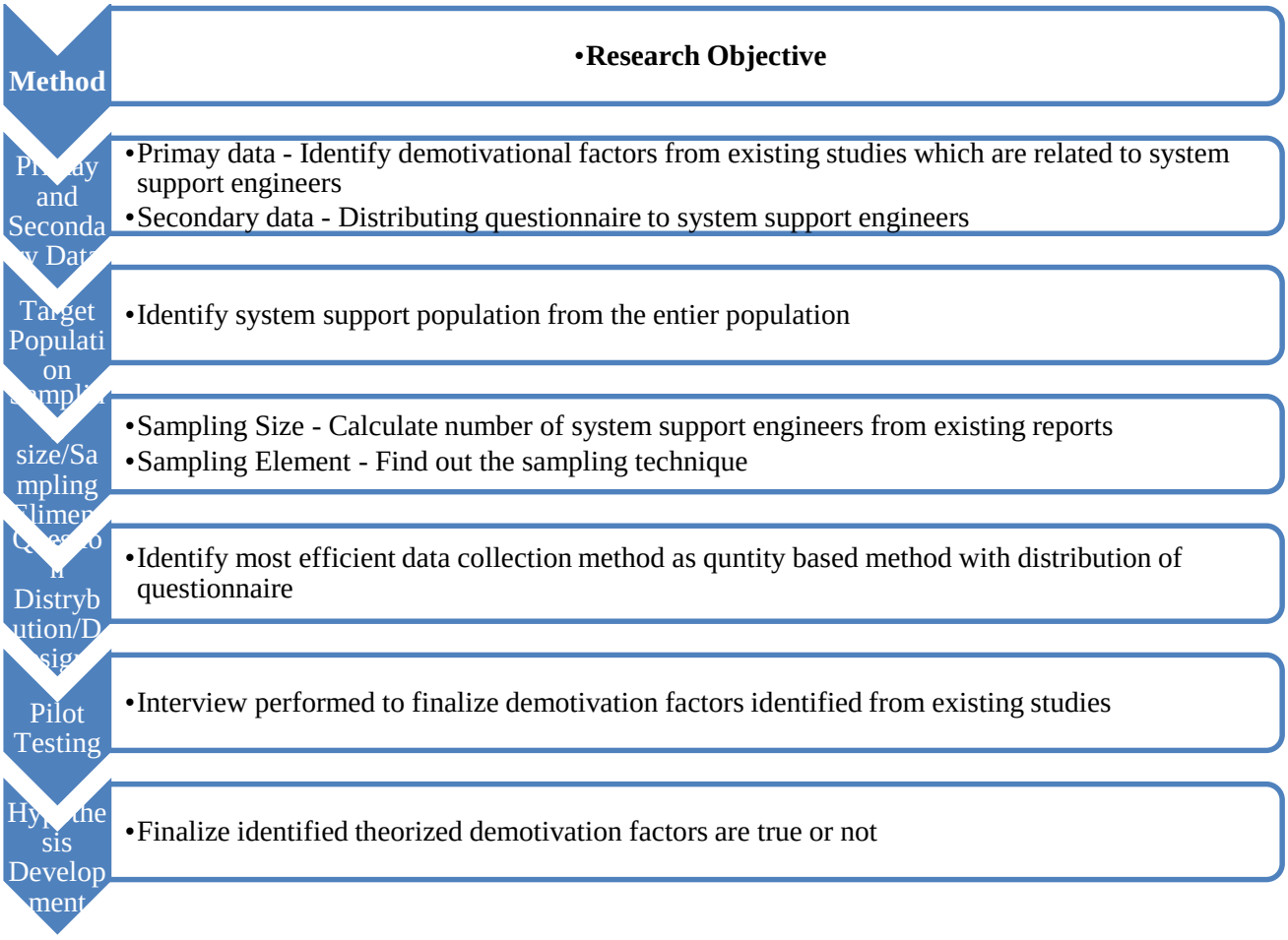

Figure 3.2: Methodology Mapping with the Research Objectives

Figure 3.1 describes how each methodology action helps to complete each research objective in this study. Left side mentioned each method used in the research and right side boxes cited about the objectives expecting to achieve. Each action performed to meet each object of the research objectives to complete the full study of the study.

3.8 Conclusion

Initially selected 25 system support engineers and performed a pilot survey in interview basis to verify the found factors from existing studies. A populated final questionnaire using the results generated from the pilot survey. Questionnaire shared with system support engineers work in IT organizations in Sri Lanka. Using two methods shared the questionnaire among system support engineers. One is an online questionnaire using Google form, and the other one is printed papers. The main reason was to use printed paper is the security reasons following in several organizations for their client satisfaction. Data analysis and interpretation were carried out using Chronbach's alpha method.

4. DATA ANALYSIS

4.1 Chapter Overview

The fourth chapter represents the data gathering, analysis of gathered data using online and paper-based questionnaire, how the collated data behave with Cronbach's alpha methods, and related future work.

4.2 Data Collection

Initially collected demotivation factors from existing studies and then selected 25 system support engineers and managers from six IT based companies and performed a pilot survey to identify whether the factors chosen are valid. The pilot survey was conducted as an interview-based data collection. The researcher identified seven demotivation factors from existing studies and during the pilot survey analysis, removed two elements from the initially defined list since they are not useful further for this research study.

Once finalized factors from the pilot survey then moved to the final study for this research study to verify whether finalized factors are correct. In the beginning, the researcher planned to conduct an online survey in IT based companies where system support engineers and managers are working. However, considering the security concerns of some organizations, the researcher planned to conduct online and paper-based questionnaire distribution to system support engineers and support managers — online questionnaire distributed using e-mails, WhatsApp, Viber, and LinkedIn. Once received responses match to the sample size, started data cleaning for the data set. As a result of data, the cleansing researcher has 360 acceptable responses to the data analysis process.

4.3 Descriptive Analysis

Descriptive analysis is used to present collected data in a summarized and meaningful way. Below section shows how the demographic profile behaves among system support engineers and managers. The analysis was done for system support employees' experience, a working process like meet SLA agreement; follow the ITIL process, etc.

4.3.1. Analyze respondents' demographic profile using charts

The target population for this study is the system support professionals in the IT industry in Sri Lanka. The other consideration is selecting companies was that the companies with system support engineers. The survey conducted using an online questionnaire and a paper-based questionnaire. The paper-based questionnaire distributed because some companies are not allowing access to Google form or any other online-based forms inside the organization considering the security purpose of their client and internal details.

Used social media such as Facebook, LinkedIn, and emails, and phone calls to reach out to participants.

Figure 4.1 shows the breakdown of participants based on their job role. This study target on system support team leads and system support engineers members in several teams and organizations. 38.89% of participants are working as system support leads, and 61.11% of participants are working as team members.

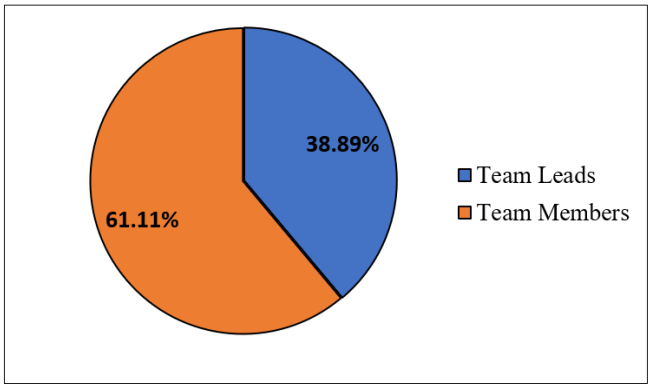

Figure 4.1 Team Leads & Team Member Distribution

Professional distribution can be seen in Figure 4.2 as 27.78% participants are 0 – 3Years of experience, 40.83% participants having 3 – 6 Years of experience, 22.22% participants are 6 – 9 Years of experience and 9.17% participants are having more than 9 Year of experience in IT industry.

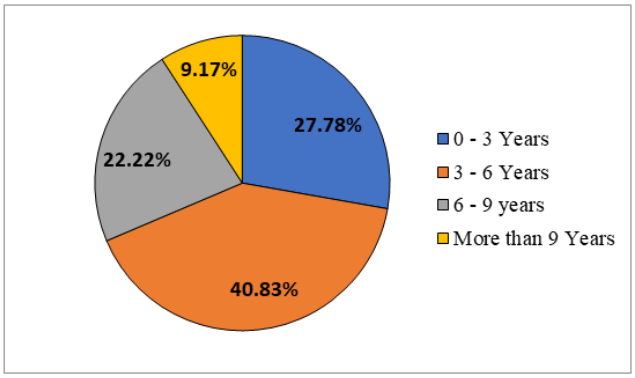

Figure 4.2: Distribution of Work Experience in Current Organization

Among these system support engineers are joining as system support engineers after getting some other IT industry work experience as a developer, QA engineer, etc. Therefore, Figure 4.3 shows the experience distribution as system support engineers in the IT industry.

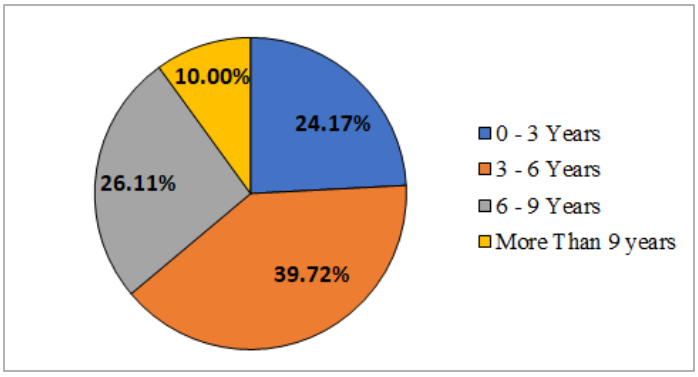

Figure 4.3: Distribution of Support Experience in System Support Area

The most critical factor of system support engineers is providing support for their clients' production systems. In this reason, based on the impact organizations and clients are defying Service Level Agreement, and it has included the target issue completion time or resolution time for relevant issue categories. Figure 4.4 shows how many participants are following SLAs to resolve issues.

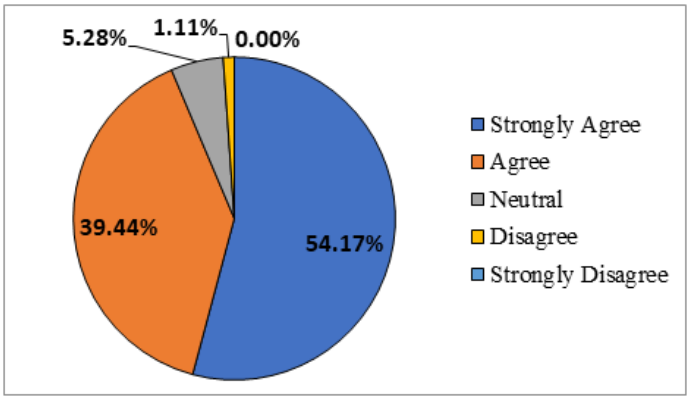

Figure 4.4: Work under SLA

ITIL is one of the most important processes which most organizations are developing to maintain standard service to their client with their production systems. Figure 4.5 try to understand which level participants are following ITIL process for their BAU process as a support engineer.

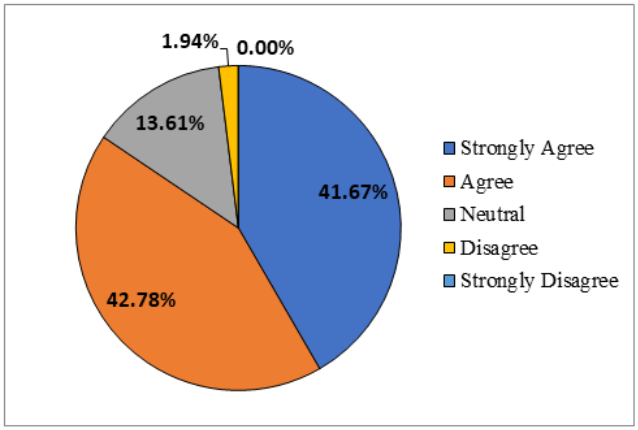

Figure 4.5: ITIL Followers

4.3.2. Analyze respondents' demographic profile statistical Method

Section 4.3.1 graphically presents demographic distribution. The analyzed demographic profile statistics represent statistically in this Section. This statistical data measures using 360 responses after cleaning the whole responses received.

Table 4.1: Presents the demographic variables with scale and the questionnaire items

Variable	Number of Items	Measurement	Scale
Experience	2	Four Point Likert Scale	Interval
Team Leader/Team Member	1	Four Point Likert Scale	Interval
Interest in System Support Area	1	Text box	
Adherer to SLA	1	Five Point Likert Scale	Interval
Follow ITIL process	1	Five Point Likert Scale	Interval
Make sure the system availability	1	Dichotomous	Yes/No

Table 4.2 represents, responses contain 140 out of 360 of responses from team leads and 220 out of 360 of responses from team members of various organizations and several teams. Once the calculated percentage, 38.89% are working as a team lead of support engineers, and 61.11% are working as team members from multiple projects and teams.

Table 4.2: Team Leads & Team Member Distribution

Team Leads & Team Member Distribution					
	Team	Frequency	Percentage	Valid Percentage	Cumulative Percentage
Valid Questions	Team Leads	140	38.89	38.89	38.89
	Team Members	220	61.11	61.11	100
		360	100	100	

Table 4.3 represents the working experience in the current organization. According to the calculation, the highest percentages of employees are working between 3-6 years in the current organization. That is 40.83% as a percentage and 147 employees out of 360 employees. Remaining is 27.78% from 0 – 3 years, 22.22% from 6 – 9 years and 9.17% respectively.

Table 4.3: Work Experience in the current organization

Work Experience in the current organization					
	Experience (Years)	Frequency	Percentage	Valid Percentage	Cumulative Percentage
Valid Questions	0 – 3	100	27.78	27.78	27.78
	3 – 6	147	40.83	40.83	68.61
	6 – 9	80	22.22	22.22	90.83
	9 & more	33	9.17	9.17	100
		360	100	100	

System support engineer role is one of the areas derived from the software engineer role, and it has a short history in IT industry in Sri Lanka; therefore, some of the employees initially joined as developers, QA engineers or BA analysis, etc. to the IT industry. As a result of this situation very less (10%) of people worked as a support engineer for more than 9 Years. There are 39.72 percent of employees having 3 – 6 years of experience as support engineers or support team leads.

Table 4.4: Work Experience in System Support Area

Work Experience in System Support Area					
	Experience (Years)	Frequency	Percentage	Valid Percentage	Cumulative Percentage
Valid Questions	0 – 3	87	24.17	24.17	24.17
	3 – 6	143	39.72	39.72	63.89
	6 – 9	94	26.11	26.11	90
	9 & more	36	10	10	100
		360	100	100	

Service Level Agreement is an important value for measuring the performance of system support engineers, and SLA is implemented based on the impact for the users of the system. More than half of the percentage is highly considering the SLA during their work. Very less percentage is poorly considering the SLA, and no one is completely removing the concept of SLA.

Table 4.5: Work Under SLA

Work Under SLA					
	5 Likert Scale	Frequency	Percentage	Valid Percentage	Cumulative Percentage
Valid Questions	Strongly Agree	195	54.17	54.17	54.17
	Agree	142	39.44	39.44	93.61
	Neutral	19	5.28	5.28	98.89
	Disagree	4	1.11	1.11	100
	Strongly Disagree	0	0.00	0.00	
		360	100	100	

ITIL is a best practice following support employees to provide better support to their customers. Altogether, 84.45% of employees are following ITIL process during the work. 13.61% of employees are following ITIL process to a somewhat level.

Table 4.6 ITIL Process Followers

ITIL Process Followers					
	5 Likert Scale	Frequency	Percentage	Valid Percentage	Cumulative Percentage
Valid Questions	Strongly Agree	150	41.67	41.67	41.67
	Agree	154	42.78	42.78	84.45
	Neutral	49	13.61	13.61	98.06
	Disagree	7	1.94	1.94	100
	Strongly Disagree	0	0.00	0.00	
	Total	360	100	100	

4.3.3. Central Tendencies Measurement of Constructs

System support services have approximately ten years of in the Sri Lankan IT industry, and it shows with the statistics present in table 4.4 (Distribution of system support engineers are.). The support engineers' contribution is only 10% with the experience of more than 9years of experience. However, statistics display that employee tending to work as system support engineers. There are 26.11 employees % having 6 – 9 years of experience and 39.72% of support engineers having experience between 3 – 6 years. 24.17 Years' experience is having 24.17% of support employees. Table 4.4 shows the support engineer area increased becoming famous among software engineers.

During the analysis of the demographic profiles, more than half of the support employees are aligned with the client Service Level agreement during their BAU work within the relevant

project. The SLA is one of the most important factors for support engineers since they are working with production systems, and if system failure can be a considerable revenue loss for their client organization. Table 4.5 shows when analyzing the statistical calculations of Figure 4.4. (Work Under SLA).

Also, providing better service is a significant concern for all IT organizations. Most organizations are willing to adapt to the ITIL process of maintaining the high standards of the support processes. Some organizations are providing pieces of training and participate their employees for the ITIL exams to get the certifications. Table 4.6 proves when looking at ITIL Process Followers, most of the employees are following the ITIL standard process during their Daily work. Statistically, it is 84.45% who are using ITIL process. 13.61% of support engineers use ITIL process some level with their work process.

4.4 Scale Measurement

4.4.1. Reliability Test – Pilot Survey

Reliability is an essential test for any research study. Initially identified eight factors and conducted interviews with twenty-five people who are working as support engineers and support team leads. These employees selected from reputed IT organizations and who are having support projects in the organizations. Also, employees should work in a support project as a support employee. Based on the interview, some of the questions removed and some of the questions restructured with relevant factors.

The identified factors from current research studies: Management, Learning & Development, Technology, Company Culture, Rewards, Tools, and Knowledge Base Systems

The finalized factors identified conducting interviews.

- Management
- Learning & Development
- Technology
- Company Culture
- Rewards

Analyzing data from the pilot survey, the researcher has decided to remove factors Processes and use of Knowledge Base System based on the responses received from the interviewees. All of the participants do not accept that using knowledge base systems are a tendency to employees are demotivated. The support engineers and managers perspective, tools are one of the factors that speed up their work and not are demotivation factors.

4.4.2. Reliability test for sample

There were thirty-five items selected with five independent variables. The Table 4.7 list Cronbach's alpha coefficients for the independent variable, respectively. The calculated sample size is 360, and once cleanses the data valid response count was 360. Therefore, 360 responses considered to analyzing the data to check the defined hypotheses.

Table 4.7: Cronbach's alpha coefficients for the independent variable

Independent Factor	Number of questions accepted	Number of questions eliminated	Cronbach's alpha
Management	6	0	0.636
Company Culture	5	0	0.634
Learning and Development	2	0	0.495
Technology	3	1	0.667
Rewards	9	1	0.673

There are five independent variables with 25 questions in the online survey. Management independent factor has 6question and no any question eliminated from the questionnaire. Company culture, Learning & Development factors also show better reliability with all questions. However, Technology and Reward independent factor shows better reliability once remove one question from each independent factor.

4.5 Inferential Analyses

4.5.1. Inter-item Correlation Analysis

The analysis performed for all variables to check the correlation of inter-items of every variable. Management, Learning and Development, Technology, Company Culture, and Rewards ware independent factors identified during the study, and all elements of the

analysis were positively correlated with each other within the selected elements. The inter-item correlation outputs are represented in Table 4.8 – Table 4.13. These Tables include only selected independent factors for the study.

According to the inter-item correlation test for Management factors were positively correlated within respective dimensions. When considering Management, there were six items and three dimensions. The inter-item of correlation of Management represent in Table 4.8.

Table 4.8: item correlation for Management

	(1)	(2)	(3)	(4)	(5)	(6)
Not giving chance to express ideas (1)	1.000	0.450	0.330	0.077	0.210	0.153
Not giving mentoring (2)	0.450	1.000	0.327	0.099	0.238	0.093
Not Accept Failures (3)	0.330	0.327	1.000	0.054	0.205	0.103
Poor Management leads to demotivation (4)	0.077	0.099	0.054	1.000	0.188	0.410
Manager Failed to guide (5)	0.210	0.238	0.205	0.188	1.000	0.486
Manager not assigning challenging work (6)	0.153	0.093	0.103	0.410	0.486	1.000

There were five items and three dimensions of the independent factor for Company Culture, and each dimension factor is positively correlated with each other, and it's not the same as different dimension factors. Only, two items for two dimensions defined for Learning and development independent factors for this study. Both aspects are positively correlated with each factor.

Table 4.9: Inter-item correlation for Company Culture

	(1)	(2)	(3)	(4)	(5)
Less Innovation (1)	1.000	0.171	0.137	0.230	0.286
Team Members Collaboration (2)	0.171	1.000	0.392	0.209	0.268
Poor relationship of coworkers (3)	0.137	0.392	1.000	0.193	0.222
Company Stabilized Process (4)	0.230	0.209	0.193	1.000	0.525
Company Strategic Plan (5)	0.286	0.268	0.222	0.525	1.000

Table 4.10 Inter-item correlations for Learning and Development

	(1)	(2)
Participate Training (1)	1.000	0.332
Same work routing (2)	0.332	1.000

Reward also identified during this research study. There are nine items with four dimensions to analyze the demotivation factors of support engineers. Every factor is positively correlated internally. Before analyzing the inter-item correlation, one item removed to calculate the coefficient of the factors relates to rewards. To identify the inter-item correlation of Technology, the researcher used three items with two dimensions, with all factors positively correlated with each other factor.

Table 4.11: Inter-item correlation for Rewards

Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Shift Allowance (1)	1.000	0.218	0.082	0.306	0.233	0.425	0.170	0.167	0.119
Monetary Incentive (2)	0.218	1.000	0.215	0.232	0.159	0.146	0.184	0.211	0.118
Award Transparency (3)	0.082	0.215	1.000	0.313	0.113	0.140	0.091	0.008	0.045
Performance Appraisal Transparency (4)	0.306	0.232	0.313	1.000	0.274	0.402	0.132	0.289	0.202
Less Recognition of individual and team (5)	0.233	0.159	0.113	0.274	1.000	0.208	0.179	0.124	0.274
Less recognition of Management (6)	0.425	0.146	0.140	0.402	0.208	1.000	0.272	0.249	0.194
Public or Private Appreciation (7)	0.170	0.184	0.091	0.132	0.179	0.272	1.000	0.234	0.084
Written or Verbal Appreciation (8)	0.167	0.211	0.008	0.289	0.124	0.249	0.234	1.000	0.115
Manager Less Appreciation (9)	0.119	0.118	0.045	0.202	0.274	0194	0.084	0.115	1.000

Table 4.12: Inter-item correlation for Technology

	(1)	(2)	(3)
New Technology (1)	1.000	0.339	0.343
Technically Challenging Work (2)	0.339	1.000	0.523
Resolving High Priority Issues (3)	0.343	0.523	1.000

4.6 Binomial Logistic Regression

This study used Binomial Logistic Regression to test the hypotheses which defined in chapter 3. The reason behind to select this statistical method is the dependent variable of measuring less productivity has been identified as a dichotomous question in the survey.

All cases performed with a variable transformation to reverse or reciprocal transformation since during the analysis researcher identified that skewed is extremely positive, and it should need to be converted to normality. Therefore extremely positive skewed data convert to normalcy using the inverse method.

Table 4.13, a binomial logistic regression was performed to determine the effects of Manager not giving a chance to Express Ideas, Manager is Not giving Mentoring, Manager is not accepting failures, Poor Management leads to Demotivation, Manager is Failed to Guide and Not to assign challenging work on the likelihood that participant's productivity being demotivation. The logistic regression model was statistically significant, $\chi 2\ (4) = 76.996$, $p < 0.005$. The model explained 54.6% (Nagelkerke R2) of the variance in productivity and correctly classified 94.3% of cases. Sensitivity was 31.8%, specificity was 99.0%.

Table 4.13: Binomial Logistic Regression for Management

Variables	Calculation						95% C.I for EXP(B)	
	B	S.E	Wald	Df	Sig.	Exp(B)	Lower	Upper
Not giving chance to express ideas	0.095	0.258	0.135	1	0.713	1.1	0.663	1.824
Not giving mentoring	-1.554	0.358	18.857	1	0	0.211	0.105	0.426
Not Accept Failures	3.39	0.829	16.721	1	0	29.672	5.843	150.678
Poor management leads to demotivation	-0.094	0.429	0.048	1	0.827	0.91	0.392	2.112
Failed to guide	0.623	0.383	2.655	1	0.103	0.536	0.253	1.135
Not assign challenging work	0.197	0.435	0.204	1	0.652	1.217	0.518	2.858
Constant	3.128	2.181	0.057	1	0.152	22.829		

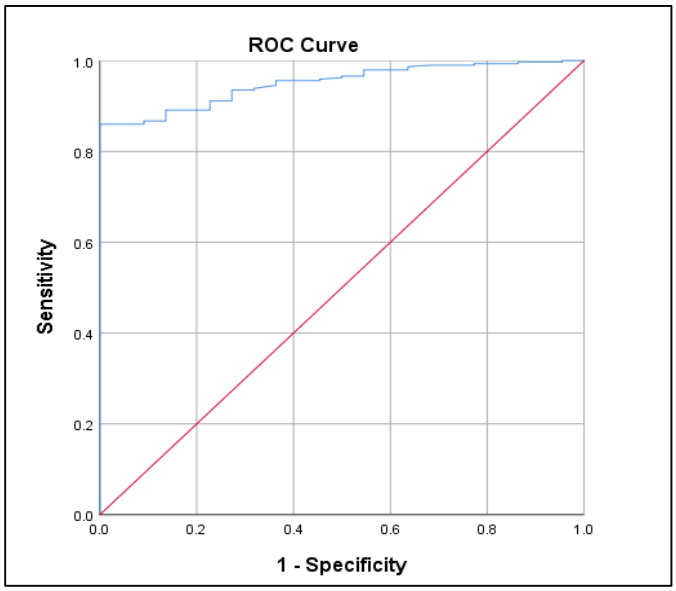

Figure 4.6: ROC curve for management

Table 4.14: Area Under the Curve for Management

Area	Std. Error	Asymptotic Sig.b	Asymptotic 95% confidence interval	
			Lower Bound	Upper Bound
0.95	0.013	0	0.924	0.976

Table 4.15 binomial logistic regression was performed to ascertain the effects of shift allowance, monetary incentives, award transparency, Performance appraisal transparency, less recognition of individual, less recognition of management, appreciation methods, Public or private appreciation, written or verbal appreciation, Manager less appreciation on the likelihood that participant's productivity being demotivation. The logistic regression model was statistically significant, $\chi 2$ (4) = 27.727, $p < 0.005$. The model explained 12.4% (Nagelkerke R2) of the variance in productivity and correctly classified 82.6% of cases. Sensitivity was 6.5%, specificity was 98.6. Out of 9 variables, only three variables are statistically significant: Shift allowance, monetary incentives, and transparency during providing awards. Increasing Shift allowance and monetary incentives were associated with reduced likelihood of exhibiting system support demotivation.

Table 4.15: Binomial Logistic Regression for Rewards

Variable	Calculation						95% C.I for EXP(B)	
	B	S.E	Wald	df	Sig.	Exp(B)	Lower	Upper
Shift Allowance	0.347	0.203	2.928	1	0.087	1.415	0.951	2.106
Monetary Incentives	-0.643	0.216	8.834	1	0.003	0.526	0.344	0.803
Award Transparency	0.626	0.155	16.368	1	0	1.869	1.381	2.531
Performance Appraisal Transparency	-0.022	0.205	0.012	1	0.913	0.978	0.654	1.462
Less recognition of individual and team	-0.052	0.142	0.135	1	0.713	0.949	0.718	1.254
Less recognition of management	0.119	0.177	0.45	1	0.502	1.126	0.796	1.594
Public or Private appreciation	-0.179	0.1622	1.233	1	0.267	0.836	0.609	1.147
Written or Verbal appreciation	0.108	0.177	0.399	1	0.528	1.114	0.797	1.558
Manager less appreciation	-0.034	0.133	0.064	1	0.8	0.967	0.745	1.255
Constant	0.326	1.153	0.08	1	0.777	1.385		

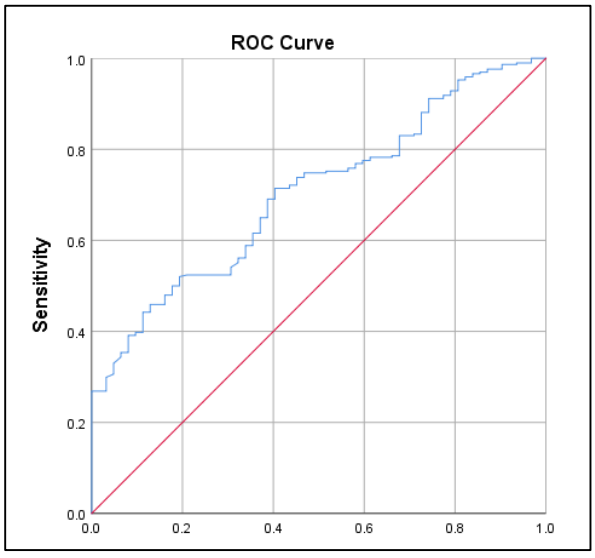

Figure 4.7: ROC curve for Rewards

Table 4.16: Area Under the Curve for Rewards

Area	Std. Error[a]	Asymptotic Sig.b	Asymptotic 95% confidence interval	
			Lower Bound	Upper Bound
0.703	0.032	0	0.64	0.766

Binomial logistic regression was performed to ascertain the effects of Participate Trainings and Same Work Routing on the likelihood that a participant's productivity being demotivation. The logistic regression model was statistically significant, $\chi 2$ (4) = 12.782, p < 0.002. The model explained 5.8% (Nagelkerke R2) of the variance in productivity and correctly classified 82.4% of cases. Sensitivity was 0.0%, specificity was 100.0%. The out of 2 variables Participate training is significant with demotivation of employees.

Table 4.17: Binomial Logistic Regression for Learning and Development

Variable	Calculation						Variable	
	B	S.E	Wald	df	Sig.	Exp(B)	Lower	Upper
Participate trainings	0.359	0.133	7.281	1	0.007	1.432	1.103	1.859
Same work routing	0.184	0.15	1.513	1	0.219	1.202	0.896	1.613
Constant	-0.369	0.568	0.423	1	0.515	0.691		

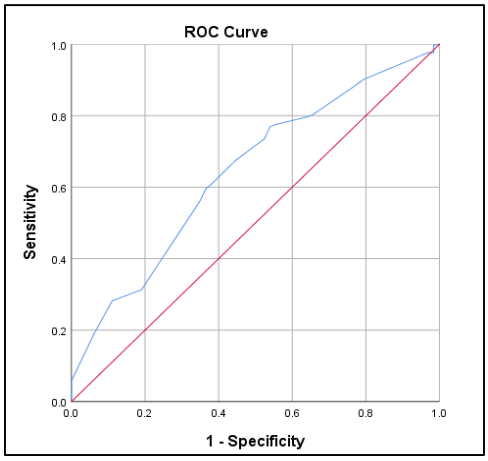

Figure 4.8: ROC curve for Learning & Development

Table 4.18: Area Under the Curve for Learning and Development

Area	Std. Error[a]	Asymptotic Sig.b	Asymptotic 95% confidence interval	
			Lower Bound	Upper Bound
0.643	0.037	0	0.57	0.717

As illustrated in Table 4.19, a binomial logistic regression was performed to ascertain the effects of less innovation, Team member collaboration, Poor relationship of coworkers, company stabilized process and company strategic plan on the likelihood that participants participant's productivity being demotivation. The model was statistically not significant, $\chi 2$ (4) = 6.720, p > 0.005. The model mentioned 3.1% (Nagelkerke R2) of the variance in demotivation affect productivity and correctly classified 82.6% of cases. Sensitivity was 0.0%, specificity was 100.0%. This result used to accept the null hypothesis with the value of p.

Table 4.19: Binomial Logistic Regression for Company Culture

Calculation							Calculation	
Variable	B	S.E	Wald	df	Sig.	Exp(B)	Lower	Upper
Less innovation	-0.085	0.164	0.268	1	0.605	0.919	0.667	1.266
Team member collaboration	0.21	0.169	1.547	1	0.214	1.234	0.886	1.717
Poor relationship of coworkers	0.109	0.194	0.312	1	0.577	1.115	0.761	1.632
Company has stabilized process	-0.44	0.234	3.545	1	0.06	0.644	0.407	1.018
Company has strategic plan	0.294	0.209	1.984	1	0.159	1.342	0.891	2.02
Constant	1.146	1.114	1.059	1	0.304	3.146		

The ROC curve can be used to measure how well a variable can distinguish between two dependent variable values. In this study checks "Does demotivation affect performance at the place of work" value with Yes/No response. Figure 4.6 – 4.10 describe the results for the above question behavior with each independent variable Management, Reward, Learning & Development, Technology and Company Culture.

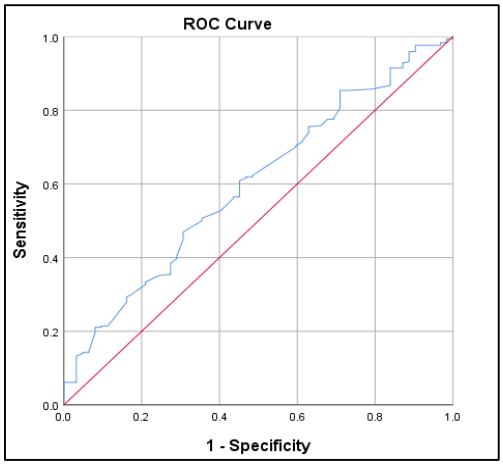

Figure 4.9: ROC curve for Company Culture

Table 4.20: Area Under the Curve for Company Culture

Area	Std. Error[a]	Asymptotic Sig.b	Asymptotic 95% confidence interval	
			Lower Bound	Upper Bound
0.599	0.038	0.014	0.524	0.674

Table 4.21, a binomial logistic regression was performed to ascertain the effects of Technology, Technically Challenging Work, and involve with High Priority issues on the likelihood that participant's productivity being demotivation. The logistic regression model was statistically significant, $\chi 2$ (4) = 34.933, $p < 0.005$. The model expressed that 18.2% (Nagelkerke R2) of the variance in productivity and correctly classified 87.0% of cases. Sensitivity was 0.0%, specificity was 100.0%. Out of 3 variables, all three variables are statistically significant: new technology, technically challenging work, and high priority issues. Increasing involvement with new technology, technically challenging work, and High priority issues were associated with reduced likelihood of exhibiting system support demotivation.

Table 4.21: Binomial Logistic Regression for Technology

Variable	Calculation						95% C.I for EXP(B)	
	B	S.E	Wald	df	Sig.	Exp(B)	Lower	Upper
New technology	-0.22	0.245	0.809	1	0.68	0.802	0.496	1.297
Technically challenging work	-0.217	0.268	0.655	1	0.418	0.805	0.476	1.361
High priority issues	-1.187	0.295	16.221	1	0	0.305	0.171	0.544
	8.641	1.561	30.658	1	0	5660.968		

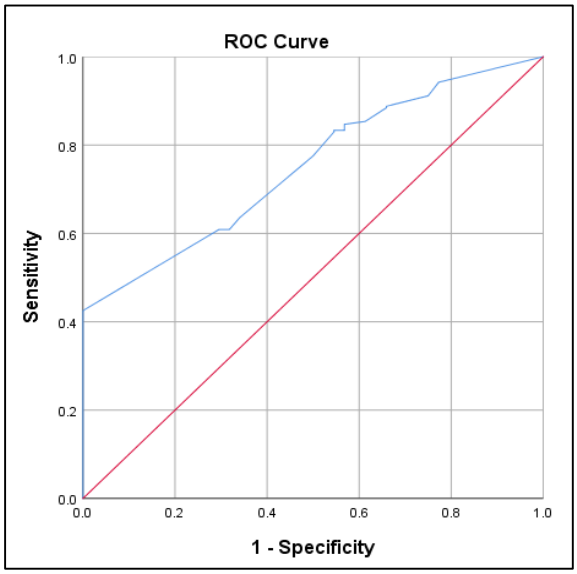

Figure 4.10: ROC curve for Technology

Table 4.22: Area Under the Curve for Technology

Area	Std. Error[a]	Asymptotic Sig.b	Asymptotic 95% confidence interval	
			Lower Bound	Upper Bound
0.75	0.032	0	0.687	0.814

4.7 Summary

To test hypotheses 1 – 5 used Binomial Logistic Regression, and Table 4.23 presents an overview of Binomial Logistic values.

Table 4.23: Summary of P value and AUC value for independent variables

Hypothesis	P Value	AUC value	Status
H1: Management and Demotivation	0.000	0.950	P is less than 0.005 and therefore rejected the null hypothesis. The AUC>0.9, and there is outstanding discrimination, according to Hosmer et al. (2013).
H2: Rewards and Demotivation	0.001	0.703	P is less than 0.005 and therefore rejected the null hypothesis. The 0.7<=AUC<0.8, and there is acceptable discrimination, according to Hosmer et al. (2013).
H3: Learning & Development and Demotivation	0.000	0.643	P is less than 0.005 and therefore rejected the null hypothesis. The 0.5<AUC<0.7, and there is poor discrimination, according to Hosmer et al. (2013).
H4: Company Culture and Demotivation	0.242	0.599	P is higher than 0.005, and therefore, the null hypothesis accepted. The 0.5<AUC<0.7, and there is poor discrimination, according to Hosmer et al. (2013).
H5: Technology and Demotivation	0.000	0.750	P is less than 0.005 and therefore rejected the null hypothesis. The 0.7<=AUC<0.8, and there is acceptable discrimination, according to Hosmer et al. (2013).

5. RECOMMENDATION AND CONCLUSION

5.1 Chapter Overview

This fifth chapter includes conclusions of the research study, suggestions, and limitation of the present study. Section 5.2 presents the outcome of the research, Section 5.4 recommendation, and Section 5.5 research limitation.

5.2 Research outcomes based on demographic analysis

5.2.1. Descriptive Analysis

Based on the descriptive analysis, system support engineer working path is an emerging area past few years in the IT industry in Sri Lanka. According to the pie chart shows in Figure 4.1, past 3-9 years rapidly increase employees in the support area. Only 10% of the employees having more than nine years of experience in support engineering. Therefore, can come up with an image of the support engineer role started before nine years and on that period the percentage of employees are very less.

According to the pie chart 4.2, most of the support engineers are tending to move the organization after six years. The fewer amount of employees are working in the same organization for more than nine years. Reasons can be to get various experiences, to grow up in the career ladder, salary concerns, etc.

ITIL is a standardized process most organization looking to provide a better support service to their client. Figure 4.5 shows that more than half of the support engineers are following the ITIL process for their BAU activities. This proves that the Sri Lankan IT industry more focusing on the standardized process to attract clients for their organization.

SLA or Service Level Agreement is one of the agreement uses between support providing organization and the client organization. SLA defined using the criticality and the revenue loss during a system failure. Therefore, both parties come up with an agreement to identify probable issues and revenue loss during system failure and issue resolving period for each type of issue. More than half of the system support engineers are strongly following the SLA during the BAU activities in their projects.

5.2.2. Scale Measurement

Table 5.1 shows the mapping between independent variables and questionnaire items. Table 5.2 presents the mapping between the independent variable and Measurement and Scale of questions. Table 5.3 presents the mapping of the dependent variable with questionnaire items.

Table 5.1: The mapping between independent variables and questionnaire items

Variable	Number of Items	Measurement	Scale
Management	6	Five Point Likert Scale	Interval
Rewards	10	Five Point Likert Scale	Interval
Learning & Development	2	Five Point Likert Scale	Interval
Company Culture	5	Five Point Likert Scale	Interval
Technology	4	Five Point Likert Scale	Interval

Table 5.2: The mapping between the independent variable and Measurement and Scale of questions

Variable	Measurement	No of Items	Scale
Experience	Five Point Likert Scale	2	Interval
Team member/leader	Five Point Likert Scale	1	Interval
Interest in the Support area	Binomial Question (Yes/No)	1	Nominal
SLA followers	Five Point Likert Scale	1	Interval
ITIL process	Five Point Likert Scale	1	Interval
System Availability	Five Point Likert Scale	1	Interval

Table 5.3: Mapping of dependent variable with questionnaire items

Variable	Dimension	Scale	Questionnaire Item
Management	Mentoring	Five Point Likert Scale	Q – 25, Q- 26
	Not Accept Failures	Five Point Likert Scale	Q – 27
	Leadership	Five Point Likert Scale	Q - 28 , Q – 29, Q – 30
Rewards	Appreciation/Recognition	Five Point Likert Scale	Q – 12 , Q – 13, Q – 14, Q – 15 , Q – 16 , Q – 17 , Q - 18
	Shift Allowances	Five Point Likert Scale	Q –09, Q – 10
	Bonuses & Monetary compensation	Five Point Likert Scale	Q – 11
Learning & Development	Learning Environment	Five Point Likert Scale	Q – 19
	Repetitive work	Five Point Likert Scale	Q – 20
Company Culture	Innovation	Five Point Likert Scale	Q – 31
	Co. Environment & Team	Five Point Likert Scale	Q – 32 , Q – 33
	Strategic plan	Five Point Likert Scale	Q – 34 , Q – 35
Technology	New Technologies	Five Point Likert Scale	Q – 21
	Challenging Work	Five Point Likert Scale	Q – 22, Q –23, Q – 24

5.3 Research outcomes about retention factors

Section 5.3 elaborates the predictability of probability of dichotomous dependent variable and independent variables. The binomial regression specifies which result is correct and which is the incorrect

5.3.1. Relationship between system support engineers de-motivation and less productive by the management of the managers

According to the binomial regression, the P value is calculated as 0.000, and it is less than 0.005, and in this scenario, the researcher can reject the null hypothesis and accept the defined interpretation. Also, the AUC value is 0.950 and higher than 0., and it is a very high value and identified as outstanding discrimination. This is a very accurate prediction on less productivity and the management variables in the research study. The result gave the best AUC value during the analysis of the survey. As a conclusion, the researcher has accepted

the hypothesis1 for this analysis. Therefore, this test shows that poor management has an impact on less productivity being demotivated.

5.3.2. Relationship between system support engineers de-motivation and less productive by a reward system in the organization

According to the binomial regression, the P value is calculated as 0.001, and it is less than 0.005, and in this scenario, the researcher can disallow the null hypothesis and picked up the defined hypothesis. Also, AUC value is 0.703 and higher than 0.5, but it is a high value and identified as acceptable discrimination. This is an accurate prediction of rewards and the fewer productivity variables in the research study. The result gave the acceptable AUC value during the analysis for the study. As a conclusion, the researcher has accepted the hypothesis2 for this analysis. Therefore, this test shows that rewarding system of an organization has an impact on less productivity being demotivated.

5.3.3. Relationship between system support engineers de-motivation and less productive by learning and development environment in the organization

According to the binomial regression, the P value is calculated as 0.002, and it is less than 0.005, and in this scenario, the researcher can disregard the null hypothesis and accept the defined hypothesis. Also, AUC value is 0.643 and higher than 0.5, but it is a moderately high value and identified as poor discrimination. This is a somewhat accurate prediction on learning & development and the fewer productivity variables in the research study. The result gives the moderate acceptable AUC value during the analysis for the study. As a conclusion, the researcher has accepted the hypothesis2 for this analysis. Therefore, this test shows that learning & development has an impact on less productivity being demotivated.

5.3.4. Relationship between system support engineers de-motivational less productive and weak company culture

According to the binomial regression, the P value is calculated as 0.242, and it is higher than 0.005, and in this scenario, the researcher can eliminate the hypothesis and selected the null hypothesis. Also, AUC value is 0.599 and bit higher than 0.5, and it is a deficient value and identified as poor discrimination, not much better than a coin toss. As a conclusion, the

researcher has accepted the null hypothesis for hypothesis 4. Therefore, this test shows that company culture has no impact on less productivity being demotivated.

5.3.5. Relationship between system support engineers de-motivation and less productive by technology

According to the binomial regression, the P value is calculated as 0.000, and it is less than 0.005, and in this scenario, the researcher can eliminate the null hypothesis and accept the defined hypothesis. Also, AUC value is 0.750 and higher than 0.5, but it is a high value and identified as acceptable discrimination. This is an accurate prediction on technology and the fewer productivity variables in the research study. Above value gave the fair AUC value during the analysis for the study. As a conclusion, the researcher has accepted the hypothesis5 for this analysis. Therefore, this test shows that technology has an impact on less productivity being demotivated.

5.4 Recommendations

System support engineers are also falling under software engineers, and they also are susceptible to management during the work on their project. Existing studies (chapter 2) showed that software engineers are susceptible to management with their project work performance and demotivation. Most of the project managers are coming from a technical background, and they need more training on how to handle employees of an organization. Considering hypothesis 1, the researcher recommends that any IT organization has a responsibility to look at individual management activity and provide proper management to system support engineers to get better performance with maintaining motivation.

Most of the organizations are organizing several ways of rewarding systems to retain employees' motivations. However, during this rewarding systems, organizations should be keen on not to demotivate remaining employees of the organization. If you look at hypothesis 2, there is an acceptable relation having with demotivation and rewarding systems of an organization. The researcher recommends to management to be transparent during employee feedback, selection employees for award ceremonies and providing monetary incentives because this can lead to some employees demotivation and it helps to make less productive

on the outcome. According to the hypothesis, the reward is one of the main factors to be considered to avoid employees demotivation.

Considering hypothesis 3, providing a learning environment also helps to avoid employees demotivation and maintain the better performance of system support engineers. IT industry is a rapidly changing area, and employees are expecting to learn new things and work with new them. Therefore, providing training and giving a chance to work with challenging work is helps to reduce demotivation, and it helps to maintain better productivity of employees.

Hypothesis 4 rejected and accepted the null hypothesis with the analysis of the study. With the result of the analysis, it shows that company culture has no impact on employee less productivity being demotivation. However, the company has a strategic plan, and a stabilized process help to make a successful organization.

It industry is a rapidly changing area, and therefore, employees are looking at new technologies and involve with them. This showed with the analysis in chapter 4 as there is acceptable discrimination on technology and employee productivity. The researcher would like to recommend all IT organizations to provide new technical training and give a chance to involve new technology for employees to maintain employee productivity without being demotivated.

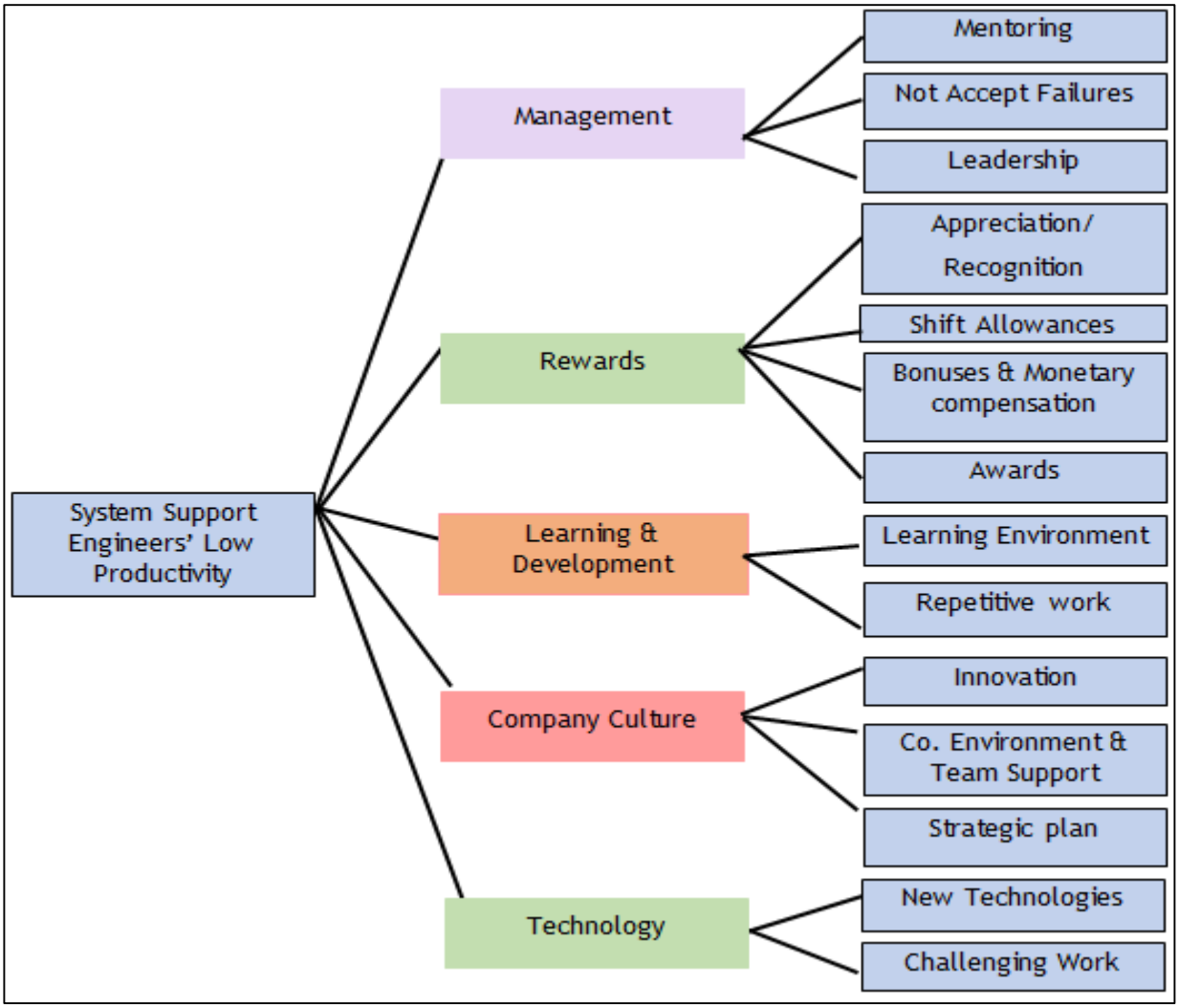

Figure 5.1: Hypothesis result mapping with a conceptual diagram

Figure 5.1 represents the result using a color code for ease of understanding the outcome of the analysis. The light purple box represents the highest sensitive, independent factor of this research. The light green boxes represent the next most upper sensitive factors as Technology and Rewards in Figure 5.1. Orange color box holds Learning & Development represent next and lower independent relationship factor for system support demotivation. The red color box holding company culture represents the factor which has accepted the null hypothesis.

5.5 Research Limitations

There are a limited number of research studies based on demotivation factors of Software Engineers, but there is very less member of literature sources relevant to support engineers. So most of the details and de-motivational elements derived from software engineers because

system support engineers also derived from software engineers and still it is an emerging area in the IT industry, Sri Lanka. Also, most research studies are from European countries and there for some of the identified factors are eliminated during the pilot survey interview results because Participants are from Sri Lanka IT industry and they have a different idea on them.

5.6 Future Research Directions

Future work can be conducted by selecting each support level separately to identify demotivation factors influencing less productivity of the organization. Productivity is the main factor all organization considering for their organization growth. The researcher can be carried out the solution to find out to reduce support engineers demotivation within the organization. Identify the solution to minimize demotivation is helped to the high growth of the IT industry in Sri Lanka since support projects are rapid growing area currently. It is a benefit to critically evaluate and make a process to reduce employee demotivation for a better IT organization.

5.7 Conclusion

Providing management training to managers, and future managers in the organization are one of the most important factors identified in the research study. Create a learning environment with numerous training and activities to employees, looking for new technologies and help employees to get new technologies while working are other factors that help to reduce demotivation of support employees. As an organization, having a good and more transparent rewarding system are some of the high-level activities that can perform as an organization to keep employees avoiding demotivation, and it helps employees productivity.

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Appendix A – Questionnaire

General questions

1) Since how many years you have been working in the current organization?
   a. 0-3 Years
   b. 3-6 Years
   c. 6-9 Years
   d. More than 9 Years
2) How many years have you been working as a system support engineer?
   a. 0-3 Years
   b. 3-6 Years
   c. 6-9 Years
   d. More than 9 Years
3) I am the team lead of my project team:
   a. Yes
   b. No
4) Why would you have interested in system support area?

5) Does demotivation affect performance at the place of work?
   a. Yes
   b. No
6) I am always adhering to Service Level Agreement agreed by management and the client?
   a. Strongly Agree
   b. Agree
   c. Neutral
   d. Disagree
   e. Strongly Disagree

7) I always follow the ITIL process to provide better support to our customers
    a. Strongly Agree
    b. Agree
    c. Neutral
    d. Disagree
    e. Strongly Disagree
8) Make sure my supporting system availability is 100%, and if in case I will work any time during the day. (On a desk or on-call support)
    a. Yes
    b. No

Rewards

Generally, system support engineers work schedule as a shift basis. Some of these projects work 24*7, and some of them are fixed shift time.

9) I like to work on a shift basis in my current project
    a. Strongly Agree
    b. Agree
    c. Neutral
    d. Disagree
    e. Strongly Disagree
10) My productivity makes less if I have assigned to a team to work on a shift basis without getting any allowances:
    a. Strongly Agree
    b. Agree
    c. Neutral
    d. Disagree
    e. Strongly Disagree

11) I am not satisfied if I do not get monetary incentives quarterly/yearly/career path basis.
    a. Strongly Agree
    b. Agree
    c. Neutral
    d. Disagree
    e. Strongly Disagree
12) I get demotivated if management selecting employees without proper transparency for award sermonizes:
    a. Strongly Agree
    b. Agree
    c. Neutral
    d. Disagree
    e. Strongly Disagree
13) I tend to less productive on my work if my performance appraisal is less transparent during my manager's feedback:
    a. Strongly Agree
    b. Agree
    c. Neutral
    d. Disagree
    e. Strongly Disagree
14) I think our management and leads having less ability to recognize our individual and teamwork:
    a. Strongly Agree
    b. Agree
    c. Neutral
    d. Disagree
    e. Strongly Disagree

15) I think less recognition of my management is impacting the productivity of my work:
    a. Strongly Agree
    b. Agree
    c. Neutral
    d. Disagree
    e. Strongly Disagree
16) I would like public appreciation than private appreciation within the team and management
    a. Strongly Agree
    b. Agree
    c. Neutral
    d. Disagree
    e. Strongly Disagree
17) I like to get written appreciation/recognition than verbal appreciation
    a. Strongly Agree
    b. Agree
    c. Neutral
    d. Disagree
    e. Strongly Disagree
18) The primary value of recognition is an acknowledgment of performance by management. My manager does not appreciate my team members or my good job
    a. Strongly Agree
    b. Agree
    c. Neutral
    d. Disagree
    e. Strongly Disagree

Learning & Development

19) Not getting chances to participate in training is affecting my motivation to work within the team:
    a. Strongly Agree
    b. Agree
    c. Neutral
    d. Disagree
    e. Strongly Disagree
20) I'm not happy to work in the same project and involve in same work routing for a longer period, and it leads to reduce my performance (e.g., working for more than 1year in the same project)
    a. Strongly Agree
    b. Agree
    c. Neutral
    d. Disagree
    e. Strongly Disagree

Technology

21) I am tending to demotivate if I have assigned to work in the same technology where I cannot grab new technical knowledge.
    a. Strongly Agree
    b. Agree
    c. Neutral
    d. Disagree
    e. Strongly Disagree

22) I get demotivated if I do not get a chance to involve with technically challenging work/issues.
    a. Strongly Agree
    b. Agree
    c. Neutral
    d. Disagree
    e. Strongly Disagree
23) If I do not get chances to work with difficult implementations/high priority issues in my own make myself demotivated on my work:
    a. Strongly Agree
    b. Agree
    c. Neutral
    d. Disagree
    e. Strongly Disagree
24) I feel bored if I'm not getting chances to apply my knowledge within my project:
    a. Strongly Agree
    b. Agree
    c. Neutral
    d. Disagree
    e. Strongly Disagree

Management

25) My manager is not giving a chance to express my ideas/problems with him/her during my work:
    a. Strongly Agree
    b. Agree
    c. Neutral
    d. Disagree
    e. Strongly Disagree

26) Our leadership is not good at guiding and mentoring team members to increase the productivity of teammates:
    a. Strongly Agree
    b. Agree
    c. Neutral
    d. Disagree
    e. Strongly Disagree
27) My manager does do not accept our human failures, and it makes me demotivated:
    a. Strongly Agree
    b. Agree
    c. Neutral
    d. Disagree
    e. Strongly Disagree
28) I think poor management leads to demotivate employees of a project:
    a. Strongly Agree
    b. Agree
    c. Neutral
    d. Disagree
    e. Strongly Disagree
29) I get a bad impression on my manager when he/she is failed to guide and to lead us during an urgent/difficult issue resolving:
    a. Strongly Agree
    b. Agree
    c. Neutral
    d. Disagree
    e. Strongly Disagree

30) I get demotivated if my manager not trusts myself and my team and not happy to assign challenging work, and it makes demotivation on team members/myself:
    a. Strongly Agree
    b. Agree
    c. Neutral
    d. Disagree
    e. Strongly Disagree

Company Culture

31) I feel despair if I am not getting support to do innovation within the organization
    a. Strongly Agree
    b. Agree
    c. Neutral
    d. Disagree
    e. Strongly Disagree
32) As an individual employee, I'm not happy to work in a team if my team members are not collaborating each other:
    a. Strongly Agree
    b. Agree
    c. Neutral
    d. Disagree
    e. Strongly Disagree
33) I get demotivated with my individual and teamwork, if the co-workers having poor relationship
    a. Strongly Agree
    b. Agree
    c. Neutral
    d. Disagree
    e. Strongly Disagree

34) I am not willing to work in a company if the company has not a stabilized process for employee development
    a. Strongly Agree
    b. Agree
    c. Neutral
    d. Disagree
    e. Strongly Disagree
35) I do not like to work in an organization if they do not have a clear strategic plan for company growth:
    a. Strongly Agree
    b. Agree
    c. Neutral
    d. Disagree
    e. Strongly Disagree

Response summary for independent variables

Identified main factor	Question	No of responses				
		Strongly DisAgree	Disagree	Neutral	Agree	Strongly Agree
Rewards	I like to work on a shift basis in my current project	17.50%	26.39%	23.33%	23.89%	8.89%
	My productivity makes less if I have assigned to a team to work on a shift basis without	0.56%	2.22%	10.56%	30.56%	56.11%
	I am not satisfied if I do not get monetary incentives quarterly/yearly/career path basis.	3.89%	4.17%	7.78%	54.17%	30.00%
	I get demotivated if management selecting employees without proper transparency for award sermonizes:	1.11%	7.78%	9.72%	44.44%	36.94%
	I tend to less productive on my work if my performance appraisal is less transparent during my manager's feedback	1.39%	2.50%	10.28%	39.72%	46.11%
	I think our management and leads having less ability to recognize our individual and team work:	4.44%	21.11%	20.00%	38.06%	16.39%
	I think less recognition of our management is impacting productivity of my work:	1.67%	7.50%	13.61%	36.39%	40.83%
	I would like public appreciation than private appreciation within the team and management:	3.06%	16.67%	28.06%	40.28%	11.94%
	I like to get written appreciation/recognition than verbal appreciation:	1.39%	6.67%	13.33%	42.50%	36.11%
	The primary value of recognition is an acknowledgment of performance by management. My manager does not appreciate my team members or my individual good job:	9.44%	28.89%	19.72%	34.44%	7.50%
Learning & Development	Not getting chances to participate in training is affecting my motivation of work within the team:	1.67%	19.17%	13.89%	40.56%	24.72%
	I'm not happy to work in the same project and involve in same work routing for a longer period and it leads to reduce my performance (e.g. working for more than 1year in a same project):	1.39%	15.28%	17.50%	50.00%	15.83%
Technology	I am tending to demotivate if I have assigned to work in the same technology where I cannot grab new technical knowledge:	1.39%	7.22%	11.11%	41.94%	38.33%
	I get demotivated if I do not get a chance to involve with technically challenging work/issues:	2.22%	6.11%	15.83%	52.22%	23.61%
	If I do not get chances to work with difficult implementations/high priority issues on my own make myself demotivated on my work:	1.39%	10.00%	21.67%	47.50%	19.44%
	I feel bored if I'm not getting chances to apply me knowledge within my project:	1.67%	10.28%	20.83%	79.17%	18.05%
Management	My manager is not giving a chance to express my ideas/problems with him/her during my work:	10.28%	29.17%	24.17%	29.72%	6.67%
	Our leadership is not good at guiding and mentoring team members to increase productivity of team mates:	8.89%	23.89%	21.67%	29.17%	16.39%
	My manager does not accept our	9.72%	34.17%	17.50%	25.00%	13.61%

	human failures and it makes me demotivated:					
	I think poor management leads to demotivate employees of a project:	0.56%	2.50%	5.00%	41.39%	50.56%
	I get a bad impression on my manager when he/she is failed to guide and leading us during an urgent/difficult issue resolving:	1.39%	8.89%	18.06%	48.06%	23.61%
	I get demotivated if my manager does not trust myself and my team and not happy to assign challenging work and it makes demotivation on team members/myself:	1.11%	4.72%	9.17%	51.11%	33.89%
Company Culture	I feel despair if I am not getting a support to do innovation within the organization:	1.67%	11.11%	22.22%	48.33%	16.67%
	As an individual employee, I'm not happy to work in a team if my team members are not collaborating each other:	1.39%	4.17%	7.50%	42.50%	44.44%
	I get demotivated with my individual and teamwork, if the co-workers having poor relationship	0.83%	2.22%	4.72%	42.78%	49.44%
	I am not willing to work in a company if the company has not a stabilized process for employee development :	0.28%	3.06%	9.72%	54.72%	31.67%
	I do not like to work in an organization if they do not have clear strategic plan for company growth:	1.11%	2.78%	10.56%	49.44%	36.11%

Response summry for dependent variable

Question	Response	
	Yes	No
Does demotivation affect performance at the place of work?	294	96

Appendix B – Inter-Item Correlation Table from SPSS

Inter- item correlation for Management

	Not_Giving_Chance_to_Express_Ideas	Not_Giving_Mentoring	Not_Accept_Failures	Poor_Management_Demotivation	Failed_to_Guide	Not_Assign_Challenging_Work
Not_Giving_Chance_to_Express_Ideas	1.000	.450	.330	.077	.210	.153
Not_Giving_Mentoring	.450	1.000	.327	.099	.238	.093
Not_Accept_Failures	.330	.327	1.000	.054	.205	.103
Poor_Management_Demotivation	.077	.099	.054	1.000	.188	.410
Failed_to_Guide	.210	.238	.205	.188	1.000	.486
Not_Assign_Challenging_Work	.153	.093	.103	.410	.486	1.000

Inter-item correlation for Company Culture

	Less_Innovation	Team_Members_Collaboration	Poor_Relationship_of_Coworkers	Company_Stabilized_Process	Company_Strateic_Plan
Less_Innovation	1.000	.171	.137	.230	.286
Team_Members_Collaboration	.171	1.000	.392	.209	.268
Poor_Relationship_of_Coworkers	.137	.392	1.000	.193	.222
Company_Stabilized_Process	.230	.209	.193	1.000	.525
Company_Strateic_Plan	.286	.268	.222	.525	1.000

Inter-item correlation for Learning and Development

	Participate_Trainings	Same_Working_Routing
Participate_Trainings	1.000	.332
Same_Working_Routing	.332	1.000

Inter-item correlation for Rewards

	Shift_Allowances	Monetary_Incentives	Award_Transperancy	Performance_Appraisal_Transpearncy	Less_Recognition_Individual_Team	Less_Recognition_of_Management	Public_Private_Appriciation	Written_Verble_Appreciation	Manager_less_Appreciation
Shift_Allowances	1.000	.218	.082	.306	.233	.425	.170	.167	.119
Monetary_Incentives	.218	1.000	.215	.232	.159	.146	.184	.211	.118
Award_Transperancy	.082	.215	1.000	.313	.113	.140	.091	.008	.045
Performance_Appraisal_Transpearncy	.306	.232	.313	1.000	.274	.402	.132	.289	.202
Less_Recognition_Individual_Team	.233	.159	.113	.274	1.000	.208	.179	.124	.274
Less_Recognition_of_Management	.425	.146	.140	.402	.208	1.000	.272	.249	.194
Public_Private_Appriciation	.170	.184	.091	.132	.179	.272	1.000	.234	.084
Written_Verble_Appreciation	.167	.211	.008	.289	.124	.249	.234	1.000	.115
Manager_less_Appreciation	.119	.118	.045	.202	.274	.194	.084	.115	1.000

Inter-item correlation for Technology

	New_Technology	Technically_Challenging_Work	High_Priority_Issues
New_Technology	1.000	.339	.343
Technically_Challenging_Work	.339	1.000	.523
High_Priority_Issues	.343	.523	1.000

Appendix C – Binomial Regression Result Tables

Binomial Logistic Regression for Rewards

		B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I.for EXP(B) Lower	Upper
Step 1[a]	Shift_Allowances	.347	.203	2.928	1	.087	1.415	.951	2.106
	Monetary_Incentives	-.643	.216	8.834	1	.003	.526	.344	.803
	Award_Transperancy	.626	.155	16.368	1	.000	1.869	1.381	2.531
	Performance_Appraisal_Transpearncy	-.022	.205	.012	1	.913	.978	.654	1.462
	Less_Recognition_Individual_Team	-.052	.142	.135	1	.713	.949	.718	1.254
	Less_Recognition_of_Management	.119	.177	.450	1	.502	1.126	.796	1.594
	Public_Private_Appriciation	-.179	.162	1.233	1	.267	.836	.609	1.147
	Written_Verble_Appreciation	.108	.171	.399	1	.528	1.114	.797	1.558
	Manager_less_Appreciation	-.034	.133	.064	1	.800	.967	.745	1.255
	Constant	.326	1.153	.080	1	.777	1.385		

Area under the Curve for Rewards

Area	Std. Error[a]	Asymptotic Sig.[b]	Asymptotic 95% Confidence Interval Lower Bound	Upper Bound
.703	.032	.000	.640	.766

Binomial Logistic Regression for Management

		B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I.for EXP(B) Lower	Upper
Step 1[a]	Not_Giving_Chance_to_Express_Ideas	.095	.258	.135	1	.713	1.100	.663	1.824
	Not_Giving_Mentoring	-1.554	.358	18.857	1	.000	.211	.105	.426
	Not_Accept_Failures	3.390	.829	16.721	1	.000	29.672	5.843	150.678
	Poor_Management_Demotivation	-.094	.429	.048	1	.827	.910	.392	2.112
	Failed_to_Guide	-.623	.383	2.655	1	.103	.536	.253	1.135
	Not_Assign_Challenging_Work	.197	.435	.204	1	.652	1.217	.518	2.858
	Constant	3.128	2.181	2.057	1	.152	22.829		

Area Under the Curve for Management

Area	Std. Error[a]	Asymptotic Sig.[b]	Asymptotic 95% Confidence Interval	
			Lower Bound	Upper Bound
.950	.013	.000	.924	.976

Binomial Logistic Regression for Learning & Development

		B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I.for EXP(B)	
								Lower	Upper
Step 1[a]	Participate_Trainings	.359	.133	7.281	1	.007	1.432	1.103	1.859
	Same_Working_Routing	.184	.150	1.513	1	.219	1.202	.896	1.613
	Constant	-.369	.568	.423	1	.515	.691		

Area Under the Curve for Learning & Development

Area	Std. Error[a]	Asymptotic Sig.[b]	Asymptotic 95% Confidence Interval	
			Lower Bound	Upper Bound
.643	.037	.000	.570	.717

Binomial Logistic Regression for Company Culture

		B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I.for EXP(B)	
								Lower	Upper
Step 1[a]	Less_Innovation	-.085	.164	.268	1	.605	.919	.667	1.266
	Team_Members_Collaboration	.210	.169	1.547	1	.214	1.234	.886	1.717
	Poor_Relationship_of_Coworkers	.109	.194	.312	1	.577	1.115	.761	1.632
	Company_Stabilized_Process	-.440	.234	3.545	1	.060	.644	.407	1.018
	Company_Strateic_Plan	.294	.209	1.984	1	.159	1.342	.891	2.020
	Constant	1.146	1.114	1.059	1	.304	3.146		

Area Under the Curve for Company Culture

Area	Std. Error[a]	Asymptotic Sig.[b]	Asymptotic 95% Confidence Interval	
			Lower Bound	Upper Bound
.599	.038	.014	.524	.674

Binomial Logistic Regression for Technology

		B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I.for EXP(B) Lower	Upper
Step 1[a]	New_Technology	-.220	.245	.809	1	.368	.802	.496	1.297
	Technically_Challenging_Work	-.217	.268	.655	1	.418	.805	.476	1.361
	High_Priority_Issues	-1.187	.295	16.221	1	.000	.305	.171	.544
	Constant	8.641	1.561	30.658	1	.000	5660.968		

Area Under the Curve for Technology

Area	Std. Error[a]	Asymptotic Sig.[b]	Asymptotic 95% Confidence Interval Lower Bound	Upper Bound
.750	.032	.000	.687	.814

Appendix D – List of Organization Participated in Survey

- IFS
- Virtusa (Pvt) Ltd
- Pearson Lanka (Pvt) Ltd
- Intel Corporation
- CodeGen International
- London Stock Exchange Group
- Millennium IT (Pty) Ltd
- Mitra Innovation
- Intervest Software Technologies
- eBuilder Technology Center
- Eutech Cybernetic
- CAMS solutions
- ZILLIONe