

**HUMAN FACTORS FOR SUCCESSFUL
ACHIEVEMENT OF INFORMATION SECURITY IN A
HIGHLY HIERARCHICAL ORGANIZATION:
A CASE STUDY**

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Degree of Master of Business Administration in Information Technology

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Sri Lanka

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DECLARATION

I declare that this is my own work, and this thesis does not incorporate without acknowledgement any material previously submitted for a Degree or Diploma in any other University or institute of higher learning, and to the best of my knowledge and belief, it does not contain any material previously published or written by another person, except where the acknowledgement is made in the text.

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.....
Date:

The above candidate has carried out research for the Master's thesis under my supervision.

.....
Signature of the Supervisor

.....
Date

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I would like to express my deepest appreciation to all those who made it possible for me to complete this research. In particular, I wish to extend my sincere gratitude to the supervisor for his constant support, guidance and encouragement, which enabled me to discover the human factors and to determine the information security industry best practices as guidelines for my current organization. He has supported and guided me throughout my research, from initial topic selection to relevant literature, from methodology to analysis, and finally in the preparation of guidelines.

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I take this opportunity to thank all my colleagues who have been by my side, encouraging and supporting me through every challenge and trial of my life at the university.

This research has helped me to develop my career in the field of IT, particularly in the subject area of IS.

ABSTRACT

In modern organizations, information security is a key area of concern. To achieve information security in a methodical manner, many organizations adopt standards for the development and application of security mechanisms as well as policies. However, the use of these information security standards in the development of security techniques and policies, must take into consideration the structure and other properties that define the particular characteristics of the organization.

This research is focused on determining human factors of the successful achievement of widely used information security standards in an organization having a highly hierarchical management structure. The research for this purpose was conducted as a case study. I have selected Sri Lanka Navy as the highly hierarchical organization.

The data for the research was collected from relevant personnel at different levels within the highly hierarchical organization. Information Technology department of the highly hierarchical organization is used on behalf of the organization for the data collection due to convenience and as it represents the same characteristics. The research has involved the use of control and management of collecting information by using a self-administered questionnaire. The data collected using this research instrument was analyzed by statistical methods to validate a set of hypotheses that were created based on an identified collection of factors, which influences the determination of human factors of the achievement of information security in a highly hierarchical organization.

The independent variables are “control of work,” “delegation,” “co-operation,” “awareness” and “attitudes” and reflect good internal consistency in the data collection instrument. The dependent variable named “Human Factors for successful achievement of Information Security in a highly hierarchical organization” has similarly high internal consistency within the research instrument.

In conclusion, the most effective human factors have been identified by using aforesaid different types of analytical methods of achievement in the information security of the highly hierarchical organization.

Keywords: Highly hierarchical organization, Human factors, Information security

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LIST OF ABBREVIATIONS

Abbreviation	Description
ANOVA	Analysis of Variance
BYOD	Bring Your Own Device
DR	Disaster Recovery
DVD	Digital Video Disk
FORISK	Formalizing Information Security Risk and Compliance
HHO	Highly Hierarchical Organization
HH	Highly Hierarchical
IS	Information Security
IT	Information Technology
ISM	Information Security Management
IS	Information Security
ISO	International Standards Organization
ISO/IEC	International Organization for Standardization / International Electro-technical Commission
ISSM	Information Systems Security Management
ISMS	Information Security Management Standard
ITIL	Information Technology Infrastructure Library
PDCA	Plan, Do, Check, Act
SCADA	Supervisory Control and Data Acquisition
SME	Small and Medium Enterprises
SPSS	Statistical Package for the Social Sciences

1. INTRODUCTION

1.1 Background

Information Security (IS) has become one of the most important aspects of Information Technology (IT) in modern organizations. This is particularly true of organizations which rely heavily on IT infrastructure and services in order to operate successfully in the global interconnected business environment. While the facts of application and operation of the IS are handled by the technology dominant aspects of design, implementation and deployment of systems, the management and control aspects of IS are reliant on the procedures and policies of the organization. In this context, the identification of human factors to improve IS and to harmonize IS related activities of an organization is critically important.

Currently, there is a plethora of documentation and a repository of knowledge available on the application of IS standards in regular commercial enterprises of different business domains with various scales of operation. However, it is less well known with regard to information about the determination of the human factors on how ISMS can be achieved effectively in a Highly Hierarchical Organization (HHO).

At present, the Information Security Management Standards are commonly used and widely accepted in organizations where IT plays a dominant role (Susanto et al., 2011) and provides guidance in the formulation of a sound Information Security Management System (ISMS) (Hsu et al., 2016).

The application of the ISMS is based on the concept of PDCA as shown in Figure 1.1 below.

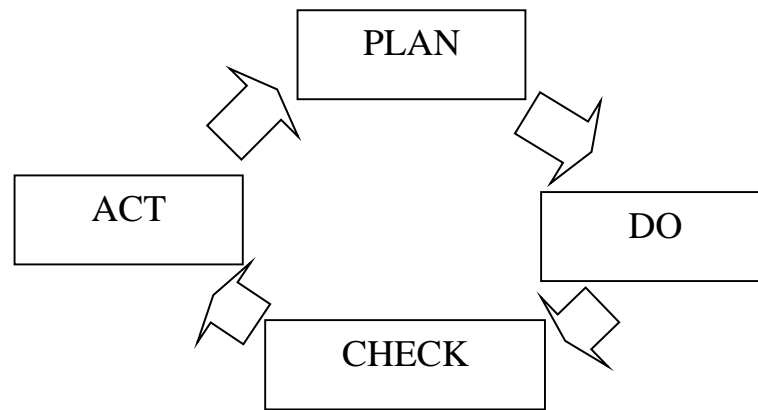


Figure 1.1: Plan, Do, Check and Act
 Source: (Beckers et al., 2012, p. 248)

The 'PLAN' process establishes the IS objectives for the management of IS. The 'DO' process indicates the application of the standard within the organization. The 'CHECK' process ensures monitoring of security and then reports the results to the management. Finally, the 'ACT' process provides preventive measures in the case of any breaches in IS. This ISM process ensures the security, confidentiality and integrity of information within the organization. This increases the quality level of IS systems in HHOs.

Human factors have a considerable impact on the application of IS in HHOs (Shojaie et al., 2015). Lack of awareness of stakeholders, unclear policies and staff rejection are the minus factors in the application of IS in an organization (Fazlida et al., 2015). The basic elements of every ISM need to be aligned with the vision, mission and goals of the organization (Haufe et al., 2016). Today, IS is no longer only an IT issue handled by the IT department, but is considered to be the collective responsibility of the entire staff of the organization. Therefore, the establishment and achievement of such an ISMS require the special focus and participation of employees at all levels and warrants their full commitment and accountability (Dey, 2007).

The objective of this study is to show the human factors and industry best practice guidelines for the achievement of IS in an HHO in order to overcome challenges and obstacles and increase the benefits to the organization.

1.1.1 Motivation

This research focuses on finding the human factors that have a significant impact on the application of IS in an HHO in the government sector of Sri Lanka, which is subject to many rules, regulations and other administrative controls defined by law. The HHO taken as a case study for this research was the Sri Lanka Navy. There had already been several IS breach incidents within this HHO and to count such occurrences there should be a proper achievement of IS in the future. Consequently, top management gave their support for the research to be carried out under the guidance of the head of IT in the HH organization.

1.1.2 Research Scope

Implementing and achieving IS standards are essential for modern organizations. However, in order for it to be successfully achieved, it is essential for employees to adhere to the policies, procedures and best practices of ISM. The first step is to obtain the commitment of the relevant personnel (top, middle, and low-level management) in the HHO to comply with the requirements of the application of IS standards. After considering the factors which affect ISM, four main factors can be identified as shown in Figure 1.2.

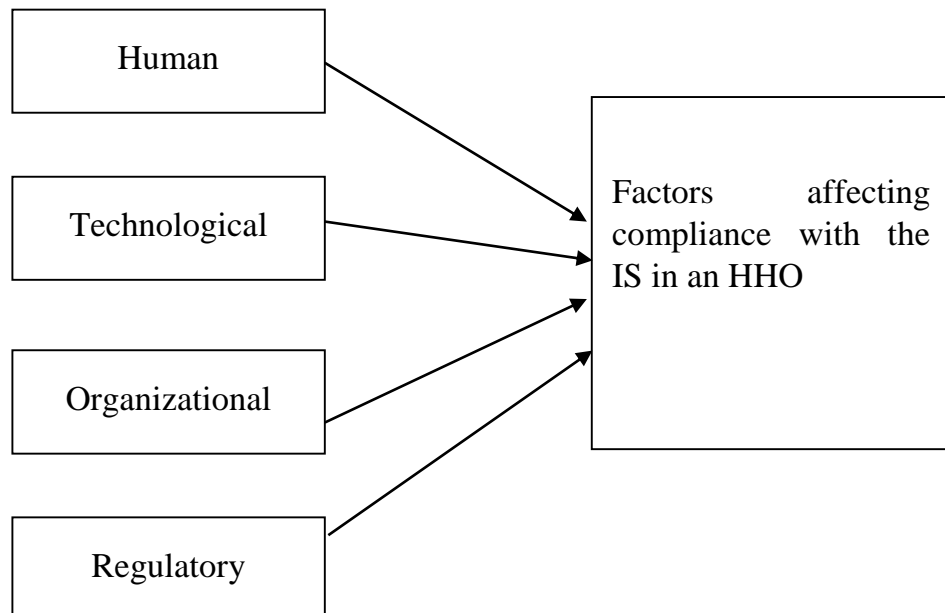


Figure 1.2: Factors affecting compliance with the IS in an HHO

Employees are the most important factor which affects IS, when compared to the other factors as shown in figure 1.2, which affect compliance with IS standards (Shojaie et al., 2015). Therefore, this study focused on the human factors in the achievement of IS in an HHO. The scope of this research was narrowed down to the human factors as other factors such as organizational, technological and regulatory factors do not adversely affect the research findings. The technological factor has low volatility as the HHO adopts new technology slowly. The regulatory factor does not change at all in HHO and organizational factor is also having rigid behavior and only the human factor elements can be manipulated.

This research is intended to determine the human factors and to show the best practices as guidelines for the achievement of the IS within the constraints of an HHO.

1.2 Problem Statement

In modern systems, activities related to IS are highly automated. Configuration interfaces allow them to be customized for specific application domains, operating scenarios, etc. However, this customization and adoption are dependent on management decisions. These decisions need to be taken in accordance with not only organizational and process requirements, but they must also be based on industry standards and best practices.

The international standard for IS in organizations where main processes and key functions are driven by IT is the ISMS 27000 series of standards. However, the process of application of this standard differs according to the organizational and management structure of the organization. This research focuses on the determination of human factors affecting the achievement of IS in an HHO in the government sector of Sri Lanka, which is subject to many rules, regulations and other administrative controls defined by law.

Management is keen on the determination of human factors of achievement of IS in the HHO and is particularly concerned about the precautions needed to be taken to

eliminate obstacles that would hinder the application of IS standards. The top management has understood the security vulnerabilities and realized that the quality of service in the HHO can be increased through addressing the human factors of the organization. Hence, the research problem can be identified as:

“People do not adhere to the achievement of IS in an HHO”

The research question can be summarized as:

“What are the human factors that affect the achievement of IS in an HHO?”

Since the human factor is of critical importance in the application of IS standards, management needs to have a suitable plan to educate employees with best practices and proper training as well as to address worker-management relations, policies and procedures, in order to convince and compel them to comply with the IS standards.

1.2.1 Research Objectives

The research objectives can be summarized as:

- To identify the most effective human factors which affect the achievement of IS in an HHO.
- To create guidelines using identified human factors, along with industry best practices to achieve IS in the HHO.

1.2.2 Research Significance

The determination of human factors affecting the achievement of IS in an HHO can ensure the highest level of IS by providing a pathway for eliminating vulnerabilities driven by human actions and supporting best practices. Hence, as this research is intended to show the most suitable guidelines for persons in the HHO to be used, they can be aligned with the IS requirements of the organizations.

1.3 Summary

This case study based research was carried out in an HHO by focusing on the IT department. The study scope was narrowed down to human factors in consideration of its importance and also due to the constraints of the study.

The main objective of the study was to identify the most effective human factors which affect the achievement of IS in an HHO and to prepare guidelines for the successful achievement of the same.

The top management understood the purpose and importance of ensuring IS and a top-down approach was applied initially. This technique is used as a motivational factor for employee empowerment in the ISM (Witus, 1986).

The ultimate aim is to determine the human factors and elaborate guidelines using best practices to align the IT policy with the organization's processes in order to provide better quality IS. This ensures efficient service delivery within the HHO.

2. LITERATURE REVIEW

2.1 Introduction

The objective of this literature review is to find out the characteristics of HHOs and the importance of human factors in the application of IS in such organizations. The study scope is limited to human factors due to its relative importance and the convenience of the data gathering process.

As a result of the literature review, five hypotheses were developed using control of work, delegation, cooperation, awareness and attitude being used as variables. These are all human factor subsets. However, one dependent variable, successful achievement of IS in an HHO was identified.

The factor, “Control of work”, was addressed in 29 of the research articles out of a total of 30 that were studied in this research. Therefore, it was identified as the most important factor in the application of IS in HHO. The second most important factor identified was “awareness,” since 22 of the IS research articles have addressed this factor. The third most important factor was identified as “co-operation” since 21 of the research articles have addressed this factor. The fourth most important factor was identified as “delegation” as it was cited in 20 of the research articles. The last factor identified was “attitude”, which was cited in 15 of the research articles.

2.2 The Structure of Organizations

The structure of the organization has been divided into two major types: 1) the traditional highly hierarchical structure (Figure 2.1) and the flat organization structure (Figure 2.2), which changes the traditional knowledge management in hierarchical organizations to a network-centric paradigm (Crawford et al., 2009). The human factor of communication within the employees has more effectiveness as hierarchy gets flattened in on the organizations and positively affects the performance of the organization.

One of the most important human aspects of IS in an HHO is, command and control. Broad procedures may have to be followed, given the circumstances of the

organizational umbrella due to the complex hierarchy in such organizations. The simpler hierarchical characteristics of flat organizations enable easy administration and knowledge management within the organization.

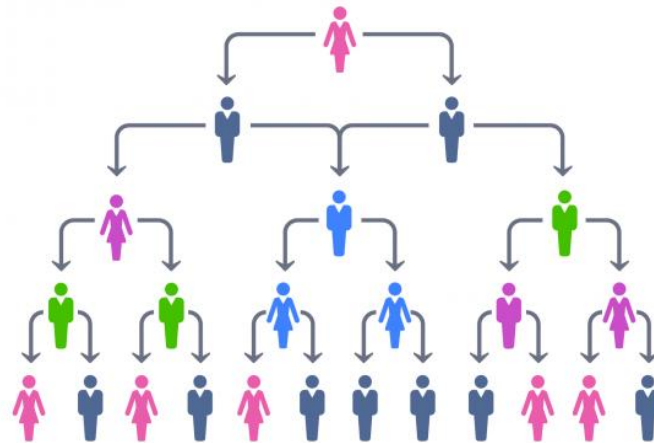
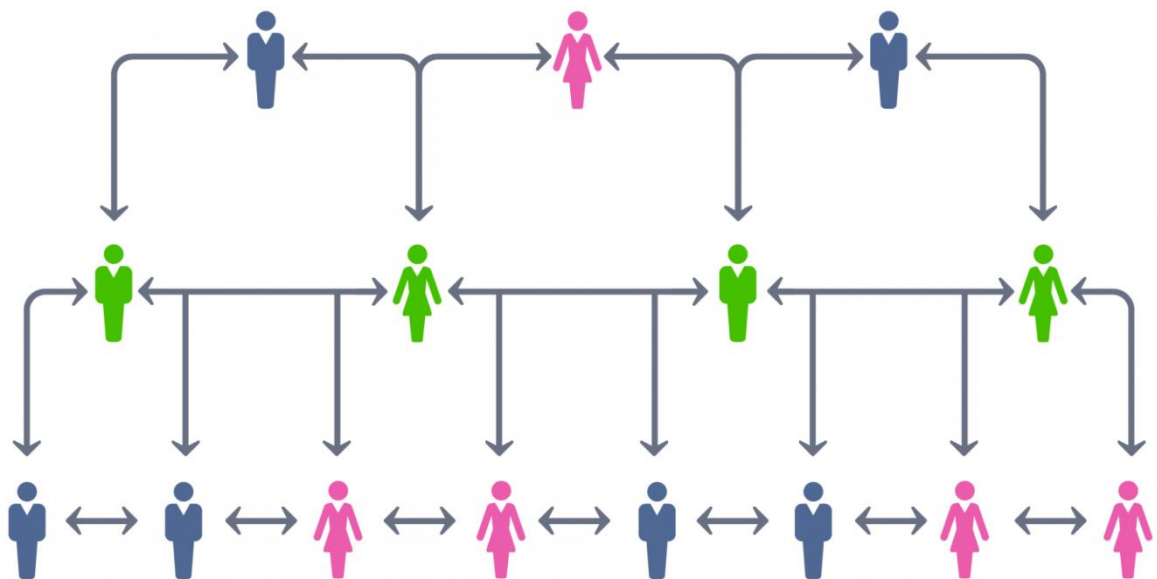


Figure 2.1: Highly Hierarchical Organization
Source: (Pluchino et al., 2011, p. 3)



The planning and resource allocation aspect of goal setting in an HHO positively affects the development of the organization. Further, the delegation of work is described as the handing over the authority within the HHO. Furthermore, giving power and command of control to subordinates in HHO increase the reliability of the

organization. These above measurements can be used to determine the human factors which cause to increase the day to day functions of the HHO (Witus, 1986).

The regulation and control measurement of the HHO affected the behavioral human factor of the employees. The application of the human factors in the control processes is described by most of the literature. The control process also has an effect on the organizations' efficiency. Further, Co-operation human factor among employees affects the performance of the organizations in a positive way. Furthermore, decision-making processes and legislative decision making are easier in a decentralized environment.

The work culture and creativity attribute together have an effect on the employees' performance in the organization. A supportive culture can foster innovation and creativity. Cultural pluralism is the main human factor of measurement used by some organizations in the process of development (Koberg & Hood, 1991).

Flat organizations can use knowledge management systems much faster than HHOs because of their inherent "flatness". The control measurement is of less importance in the flat organization, whereas it is of greater importance in an HHO (Bray, 2006).

The policies and procedures of the HHOs influence the organizations' efficiency (Pluchino et al., 2011).

2.3 Information Security Management

Management of IS is a vital aspect of the protection of the security of HHOs. The policies and procedures of the organization affect the ISM process. This needs to be addressed by the top management. Staff awareness may be the most important aspect which affects the successful achievement of IS. The knowledge and attitudes of the employees regarding IS can positively impact the ISM systems of the organization. The support of the staff and an efficient communication process with the top management are critical factors in the application of IS. Training programs conducted for the enhancement of awareness regarding IS, increase staff competency and play an important role in the ISM (Norman & Yasin, 2009).

The IS must be taken into consideration when archiving IS in HHOs. Policies and procedures which affect IS of the organization, creating awareness about IS and measuring the performance of the IS system must be considered in the application of IS (Hagen et al., 2008).

This research defines the security of the IS, processes and procedures in IS, the top-down approach of IS, and the control and documentation methods of IS management. The top-down approach is essential at the initial stage of archiving of the IS in HHOs (Beckers et al., 2012).

IS is also used for teaching IS techniques. This research discusses ISM policies, internal IS audits, physical and environmental security, communication, human resource management, operations management in the context of ISM, and the application of IS. Human resources is the main factor to be considered in the application of the IS in HHOs (Talib et al., 2012).

2.3.1 Co-operation within the Organization

The use of incentives is a useful mechanism to enhance employee co-operation, communication and delegation in an HHO. Thus, efficient communication procedures among the employees can be used for building better co-operation within the HHO (Itoh, 1992).

There are dynamics of opinion in hierarchical organizations regarding the structure, authority and direct communication process. A communication method and control of authority which allow access only to authorized employees is reflected in the behavioral characteristics of HHOs (Laguna et al., 2005).

The FORISK: Formalizing Information Security Risk and compliance management pertain to the organizations IS controls in IS risk and compliance. The regulations for formalizing IS risks, compliance management and the knowledge of the employees regarding IS risk are the main components of this risk control. The analysis demonstrates the preferred methodology for carrying out the communication process and best practices to use in FORISK. Consequently, the best practices can be used as guidelines to mitigate the risk associated with the application of the IS in an HHO (Fenz et al., 2013).

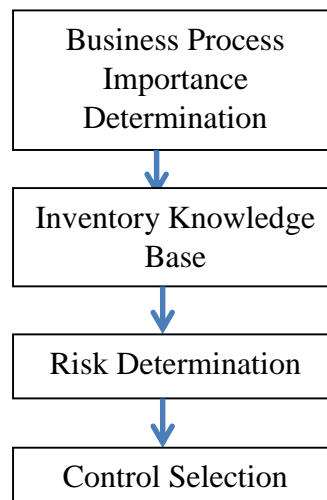


Figure 2.3: FORISK modules
Source: (Fenz et al., 2013, p. 3)

Information security management: The set of practices and regulations, data protection policy, monitoring process and controls are some of the important elements of an IS management system. It is necessary that the management and staff follow these policies and communication methods. Co-ordination of IS and top management support are critical in the application of IS in HHOs (Susanto et al., 2011).

The proactive security metrics used by BYOD (Bring Your Own Device) in an IS supported environment is mentioned in the best practices of the industry and there are policies and guidelines for the same. Therefore, user satisfaction is ensured through BYOD in an IS supported environment. The communication process and co-operation can be improved through BYOD. Policies and guidelines control the behavior of the employees, thus increasing the security of the ISM in organizations (Hajdarevic et al., 2016).

Security management: The study reviews the effect of the relationship between employees and their knowledge of IS. Management can strengthen the communication mechanism by conducting awareness training sessions for their employees regarding the IS in HHOs. Detailed descriptions of the controls used must

be defined by the management. This method provides guidance for the application of IS (Haufe et al., 2016).

2.3.2 Control of work within the Organization

A quantitative approach is used in IS risk assessment and management. The control factor in IS and how to communicate it in the organization has been described in this research. The training of the organization's staff plays a vital role in the application of IS in the organization. Guidelines have been given to prepare a policy for IS risk assessment in order to safeguard the confidentiality in IS systems. This is achieved through the introduction of policies such as the prohibition of unauthorized access (Asosheh et al., 2009).

This is an appraisal of the effectiveness and efficiency of an IS system based on the IS and demonstrates how the controls affect the effectiveness and efficiency of the employees. Standards and guidelines are needed to accomplish this task in the HHO. The control process can be strengthened by introducing new policies and guidelines to the HHO (Boehmer, 2008).

The IS considers the threat to the IS of the organization from thieves and its potential impact. A quality control process is very useful for the IS certification. A monitoring process needs to be established to monitor employee performance, in order to increase the efficiency and effectiveness of the IS in HHOs (Hsu et al., 2016).

2.3.3 Awareness within the Organization

The awareness factor also affects the application of the IS in HHOs. The evaluation process of measuring the effectiveness of the IS depends upon the hierarchy and the roles and responsibilities of the employees as defined by management. Knowledge about the effectiveness of the IS in the training and awareness process is very important in the application of the IS (Shojaie et al., 2014).

The control and awareness factors are used to explore the suitability of IS. The training guidance and quality measurement standards can be obtained from the IS (Barlette & Fomin, 2008). Awareness sessions mitigate the risk associated with the IS processes and ensure the quality of its results.

Information security management –

A practical approach to the responsibilities of the employees with regard to ISMS and regulations should be prepared by IS management. The communication process, knowledge about IS management and policies and procedures regarding IS management are very important factors when considering the information protection of the organization. Employee awareness about IS management can be upgraded by conducting training sessions on ISM. The culture of ISM eliminates the physical threats to IS. The important factors to be considered are: who is responsible for ISM and how to monitor it. A practical approach of conducting awareness programs may positively affect the performance of the IS in HHOs. Employee enthusiasm is needed for the application of ISM in HHOs (Dey, 2007).

IS policies are the most important in security management policies and this provides details on the same. The behavior of employees is a very critical factor in the application of IS. Consequently, the security of communication among the employees and employee training regarding the IS policies in IS are crucial (Cosic & Boban, 2010).

ISMS core processes -

This study explores the continuous monitoring of IS core processes and improving the knowledge of the employees about the same. The introduction of controls enables the monitoring of the IS core processes. The monitoring process has overreached the IS core processes for better information security management. Also, these details the awareness programs which can be conducted for the employees about the IS core processes in an HHO. Since it is essential to change the attitudes of the employees, this study elaborates how to carry out communication within the organization in the context of ISM (Haufe et al., 2016).

The physical and logical security management of the organization must be based on ISO 31000 and ISO 27001 ISMS. It presents the best practices and legislations regarding same. The study elaborates on the communication channels used in physical and logical security measurements. According to the prepared security regulations, the integration of the physical and logical security management and

controls are very vital factors. The relationship between employees of the organization depends upon their roles and responsibilities. The physical and logical security of the organization can be further developed through frequent training and awareness programs (Peciña et al., 2011).

The communication mechanism of the SCADA system is also an important factor in IS. Since the SCADA system needs to be continuously monitored, the adoption of reliable monitoring techniques within the organization is important. This can be achieved by conducting awareness and training sessions about the SCADA system. The next step is to implement the auditing mechanism for the SCADA system through a monitoring system to monitor login. The physical security of the SCADA system also needs to be secured through a proper mechanism (Cai et al., 2008).

2.3.4 Delegation within the Organization

The information security risk governance and implementation of the setback method relate to the risks associated with the IS systems. Moreover, governance and implementation setback have happened due to the lack of awareness of the employees and unclear policies defined about IS. The implementation of the control mechanism for the IS risk and governance may help the processes of the IS application. The regulatory rules and policies, and communication activities are the most important factors to be considered in IS implementation. Furthermore, the control mechanism needs to monitor the risk associated with the security implementation and correct governance needed for the further success of it. The process of setting the strategic goals by creating a proper communication channel from top management to lower staff is essential for this IS implementation. However, the risk associated with the implementation has to be managed using a proper governance mechanism (Fazlida & Said, 2015), even though the delegation of the responsibility of top management towards bottom level has been initiated vide above reference regarding the IS application.

The effects of the cultural dimensions in the development of ISMS based on the IS, discuss the significance of cultural characteristics in IS development in HHOs. The motivation factor and security controls are the two main factors in IS development.

Furthermore, human resources practices and awareness about ISM systems are essential best practices used in other HHOs. The communication process of the ISM systems has to be managed with control methods and knowledge management techniques. Formal and informal rules and delegation to subordinates with regard to ISMS are some other industry best practices which are used by the HHOs. Even though the arrangement of the training programs and preparation of policies with regard to IS are the two main actions which can be taken as an immediate solution, the preparation of a documentation guide and co-operation among the employees in the organization is most vital for security implementation in the organization. The management vision must support the application of the IS with effective cultural changes in the HHO. The proper process must be followed in the successful application of IS (Shojaie et al., 2015).

2.3.5 Attitude within the Organization

The integration of the International Organization for Standardization / International Electro-technical Commission (ISO/IEC) 27001 and other managerial disciplines depends on the knowledge of the employees in the organization. The results of this research study show how to improve the quality of the service and how to integrate it with ISMS. The communication process also affects the integration of IS and other managerial disciplines and a standard set of guidelines needs to be prepared for this purpose. However, the security controls also needed to collaborate with ISM. The auditing is essential to the security management discipline. The high-level structure needs to be prepared for managing the quality with IS in the context of managerial disciplines. Integration with other standards and the development of a better culture are the main factors which are considered (Anttila et al., 2012). In other words, this literature clearly stated the way to proceed with the IS in the HHO.

This IT and business process performance management case study of Information Technology Infrastructure Library (ITIL) implementation in the financial service industry discusses several processes to be followed in the organization. The processes of business management and IT governance are considered. Employee performance can be enhanced by using the guidelines developed by the management. Even though the control process can be useful for the quality maintenance and

business process of IT services, the performance management process is used in ISM as an industry best practice (Spremic et al., 2008). The positive attitudes of the employees have a greater impact on the application of IS in the HHO.

2.3.6 Consideration of the Human Factors

The human factors are highly important insight when considering the HHO IS. Hence, even this has been proved by research and discovered the behavioral factor is very much effective for the IS enhancement in the organization (Dupuis et al., 2016). The world's truth is, when the attitude is having a positive feature, consequently, the behavior will be always changing into the positive feature. These two variables are having a correlation with each other. Therefore, attitude factor is a key of concern variable to the IS achievement in the HHO.

2.4 Summary

Organization structures can be divided into two main categories namely: highly hierarchical organizations and flat structured organizations. The literature review mainly focused on human factors due to their relative importance and the ease of finding relevant information regarding same.

The literature review identified five main variables related to human factors during its data gathering. They were identified as independent variables. The dependent variable was identified as the successful achievement of IS in an HHO.

The literature review was conducted using 30 research papers. Seven main factors were identified and were further narrowed down to human factors. In the human factor, five main factors were identified, namely: control of work, delegation, cooperation, awareness and attitude.

The IS section was conducted using four research papers. This section identified the factors named: awareness, policies & procedures and approaches of the HHO.

The co-operation within the organization section was conducted using six research papers. This section identified the factors named: communication process, guidelines, control process, IS, BYOD and delegation procedure regarding the IS of the HHO.

The control of work within the organization section was conducted using three research papers. This section identified the factors named: guidelines, policies & procedures, control process and monitoring process regarding IS of the HHO.

The awareness within the organization section was conducted using seven research papers. This section identified the factors named: training, awareness process, IS management, knowledge management, IS policies & procedures, physical & logical security and monitoring of SCADA system regarding the IS of the HHO.

The delegation within the organization section was conducted using two research papers. This section identified the factors named: risk governance, regulation, rules & policies, delegation and subordinates regarding the IS of the HHO.

The attitude within the organization section was conducted using two research papers. This section identified the factors named: integration, quality control, guidelines, ITIL, control process, positive attitude and best practices regarding the IS of the HHO.

A self-administered questionnaire was prepared by using the above mentioned five independent variables and one dependent variable. Based on these variables, five hypotheses were formulated respectively, for the research study.

3. RESEARCH METHODOLOGY

3.1 Introduction

The research methodology was developed for the application of the IS in an HHO and case-based research was carried out.

The study area is relatively broad. Since it is not possible to use the qualitative research method due to the large population in this research, the best possible option was to carry out a quantitative research. The next step was to gather data for quantitative research. The research instrument used was an Internet-based questionnaire. This option was considered rather than using the traditional paper-based questionnaire, considering the convenience and ease of obtaining data from employees within the HHO through the IT department.

Some difficulties were encountered during the process of gathering data from the employees due to a large number of the population in the HHO. Two methods are available for gathering information, namely: a self-administered questionnaire and going to each person individually and filling out the questionnaire. Since the selected population has a high literacy level, the self-administered questionnaire was chosen as the data gathering method for the HHO, because manual administration of the survey was not practical.

The sample consisted of different levels of employees and assistance was given to the lower-level employees by clarifying their questions and filling their answers. The research methodology is shown in Figure 3.1.

3.2 Research Design

Five main factors were identified in this research design. As a result of the literature review, section identifications, groupings and relationships were made using these factors. The factors were measured using a self-administered questionnaire in order to obtain answers to the research question: “How can the IS being successfully achieved in an HHO?” Figure 3.1 illustrates the research methodology.

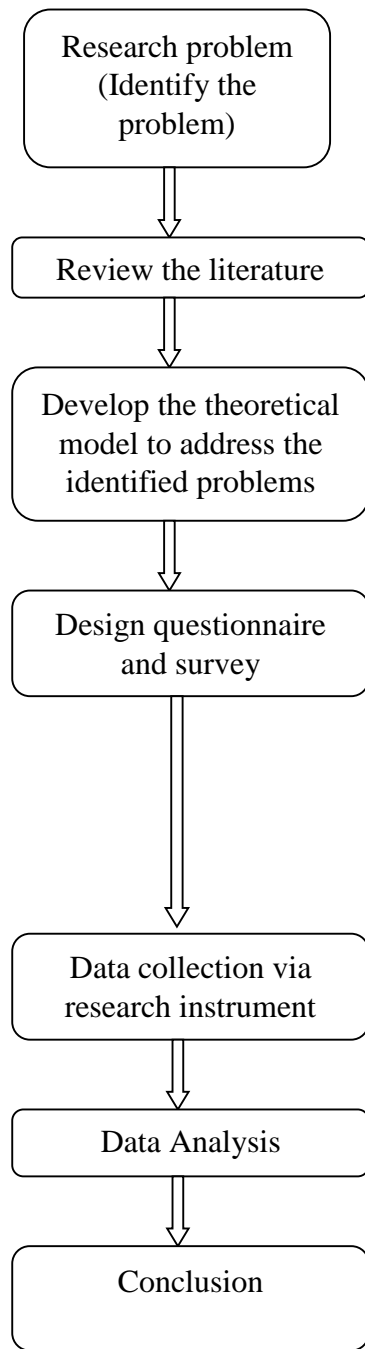


Figure 3.1: Research Methodology

3.3 Theoretical Framework

Based on the literature review, the theoretical framework illustrated in Figure 3.2 was developed. There are five independent variables that have been identified. Furthermore, one dependent variable was identified in this study. The relationship is represented by H1, H2, H3, H4 and H5 hypothesis.

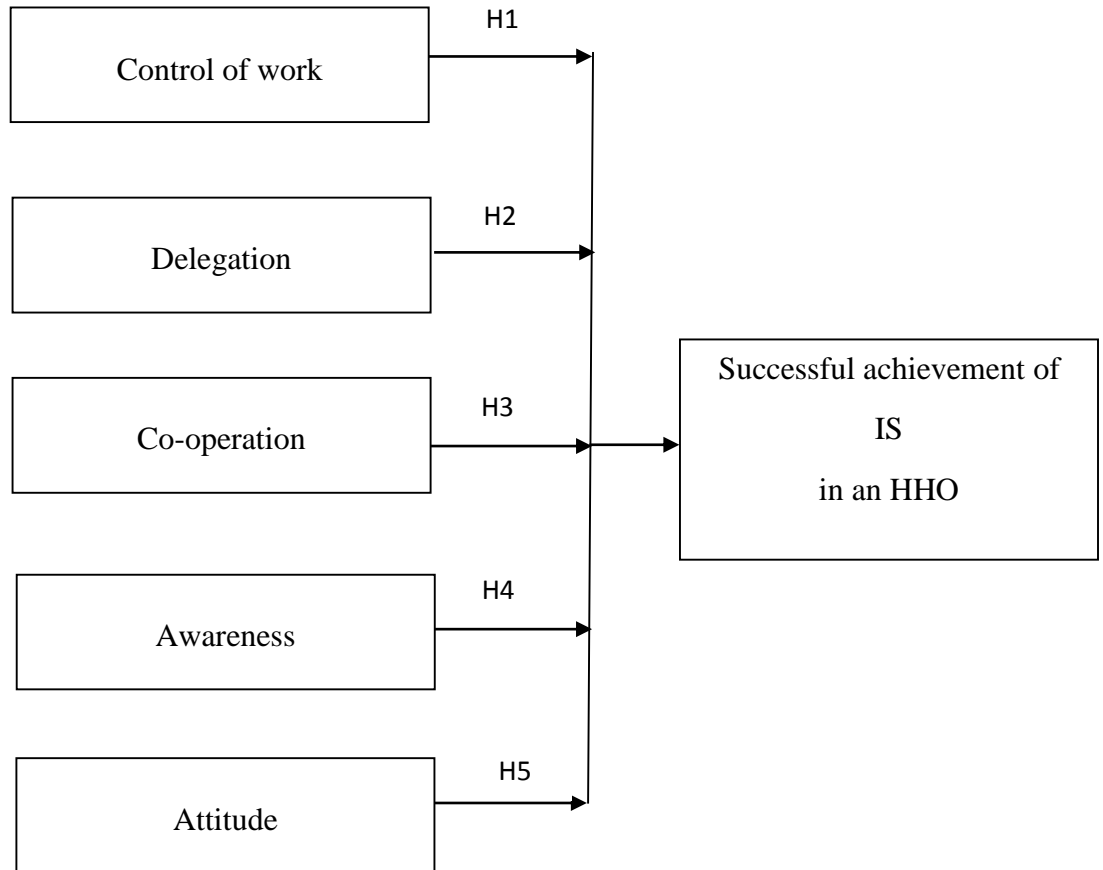


Figure 3.2: Theoretical Framework

3.3.1 Dependent Variable

The dependent variable was identified as the successful achievement of the IS in an HHO. The successful achievement of IS in an HHO is dependent upon another variable.

3.3.2 Independent Variables

The independent variables were identified as control of work, delegation, co-operation, awareness and attitude. These variables are in a relationship with other variables. A change in this variable may cause a change in the dependent variable.

3.4 Hypothesis Development

To capture the relationship between the independent and dependent variables of the conceptual model, five hypotheses have been formulated for this study.

Let;

Ha- Alternate Hypothesis

Ho- Null Hypothesis

The Ha (Alternate Hypothesis) is accepted for this research study and taken into the result of the research as we are researching on the positive impact on the variable with the dependent factor. Furthermore, Ho (Null Hypothesis) is rejected from the hypothesis development as it is representing the negative impact on the successful achievement of IS in the HHO.

Hypothesis 1

Control of work–

The definition of control of work is simply identified as a supervisor's action to influence the employee who reports to him/her. Controlling human behaviour is facilitated by giving guidelines which are intended to prepare a policy of IS risk assessment and safeguard the confidentiality of IS system (Asosheh et al., 2009). In order to obtain management motivation, it is an important aspect for the HHO. Furthermore, employees' confidence can be strengthened by introducing new policies and guidelines (Boehmer, 2008). This could also help to increase the reliability of IS security. In fact, monitoring processes need to be established to monitor security incidents of employees (Hsu et al., 2016). The relationship between control of work and the dependent variable is shown in Figure 3.3.

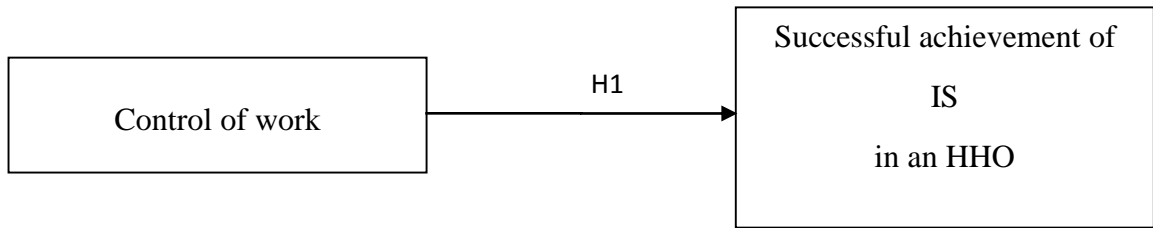


Figure 3.3: Relationship between Control of Work and the dependent variable

- H1a- Control of Work in the employees of IT Department of an HHO and the successful achievement of IS in the HHO are positively correlated
- H1o- There is no correlation between the Control of Work in the employees of IT Department of an HHO and the successful achievement of IS in the HHO

Hypothesis 2

Delegation-

The definition of delegation is the granting of authority to subordinates without having close supervision of them by the higher management. This allows to delegate the responsibility from top management towards the bottom levels of the HHO (Fazlida & Said, 2015). Furthermore, confidentiality, integrity and availability are used to implement corporate governance in the HHO. Nevertheless, cultural characteristics have been helpful to the delegation process of the employees (Shojaie et al., 2015). The relationship between delegation and the dependent variable is shown in Figure 3.4.

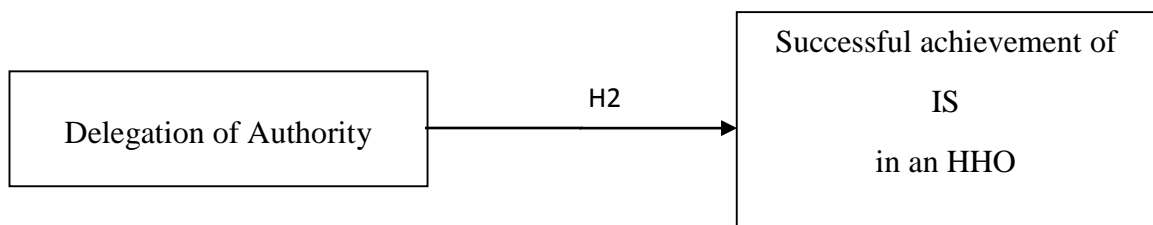


Figure 3.4: Relationship between Delegation and the dependent variable

H2a- Delegation of authority to employees in the IT Department of an HHO and the successful achievement of IS in the HHO are positively correlated

H2o- There is no correlation between the Delegation of authority to employees in the IT Department of an HHO and the successful achievement of IS in the HHO

Hypothesis 3

Co-operation-

The definition of co-operation means that the employees should work together to accomplish the objective of organization's IS application. The efficient communication procedures among the employees have been created to build better co-operation in HHO (Itoh, 1992). Also, guidelines have been used for the better communication process instead of applying regulations and standards (Fenz et al., 2013). The best practices and standards have been used to improve the IS security in the organization (Hajdarevic et al., 2016). The relationship between co-operation and the dependent variable is shown in Figure 3.5.

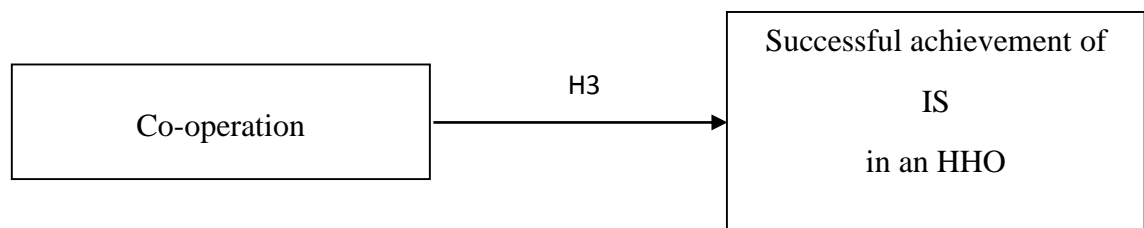


Figure 3.5: Relationship between Co-operation and the dependent variable

H3a- Co-operation of employees in the IT Department of an HHO and the successful achievement of IS in the HHO are positively correlated

H3o- There is no correlation between the Co-operation of employees in the IT Department of an HHO and the successful achievement of IS in the HHO

Hypothesis 4

Awareness-

The definition of awareness means for the employees of HHO to have knowledge about the IS. The training and awareness of the employees' were important aspects of the IS application in HHO (Shojaie et al., 2014). The training guides and quality measurement can be done by using standards and those were also important insights into the IS (Barlette Fomin, 2008). Furthermore, discipline of employees was an important aspects of the IS (Anttila et al., 2012). The relationship between awareness and the dependent variable is shown in Figure 3.6.

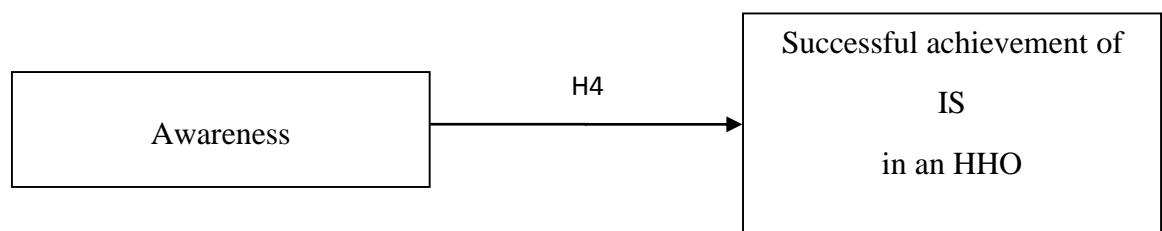


Figure 3.6: Relationship between Awareness and the dependent variable

H4a- Awareness of employees in the IT Department of an HHO and the successful achievement of IS in the HHO are positively correlated

H4o- There is no correlation between the Awareness of employees in the IT Department of an HHO and the successful achievement of IS in the HHO

Hypothesis 5

Attitude-

The definition of the attitude is the point of view that organization's employees possess about IS. The IS and other managerial disciplines depend upon the knowledge of the employees in the organization (Fenz et al., 2013). Also, the responsiveness and flexibility were other important aspects of IS application in HHO (Crewford et al., 2009). The quality that needs to be maintained in the business process and performance management are also important in the IS application

(Spremic et al., 2008). The relationship between attitude and the dependent variable is shown in Figure 3.7.

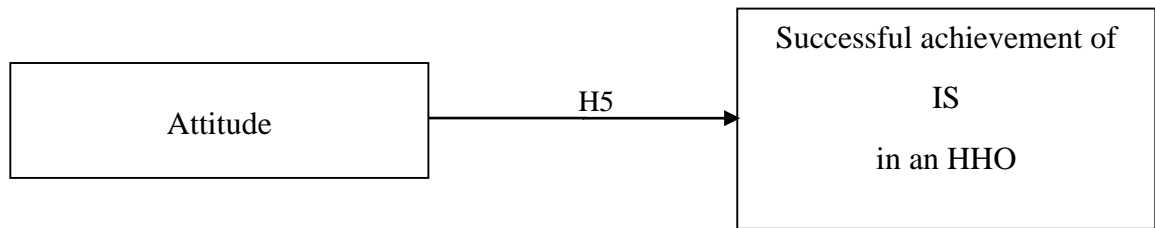


Figure 3.7: Relationship between Attitude and dependent variable

- H5a- Attitude of employees in the IT Department of an HHO and the successful achievement of IS in the HHO are positively correlated
- H5o- There is no correlation between the Attitude of employees in the IT Department of an HHO and the successful achievement of IS in the HHO

Figure 3.2 shows the theoretical framework for the development of hypotheses for the research. The hypotheses are based on the relationships among the variables. The research instrument (questionnaire) used for this research was developed based on these hypotheses. The main research objectives were to identify the human factors and to show guidelines for compliance with the application of IS in an HHO.

3.5 Dimensions

3.5.1 Dimension for the achievement of Information Security in an HHO

The research methodology process defined the variables and defined the measurement dimensions and obtained the measured values through an experiment.

The definition of achievement of information security for HHO has elaborated how it is heavily dependent upon several human factors of HHO. It is vital to protect IS in HHO to obtain a competitive advantage with other HHO (Norman Yasin, 2009). Also, the policies, procedures and awareness were important aspects of IS in HHO (Hagen et al., 2008). Furthermore, physical and logical security can be developed

through IS in HHO (Pecina et al., 2011). The dimension, item count and scale of the dependent variable are shown in Table 3.1.

Table 3.1: Dimension, Item count and Scale of Dependent variable

Variable	Dimension	Item count	Scale
Successful achievement of IS in an HHO	Competitive advantage	1	Five points Likert scale
	Physical and Logical Security	1	Five points Likert scale
	Policies and Procedures	1	Five points Likert scale

3.5.2 Dimensions for Control of work variable

The management motivation and monitoring are important factors when the control of work variable is considered. Therefore, such dimensions in control of work variable are shown in Figure 3.8.

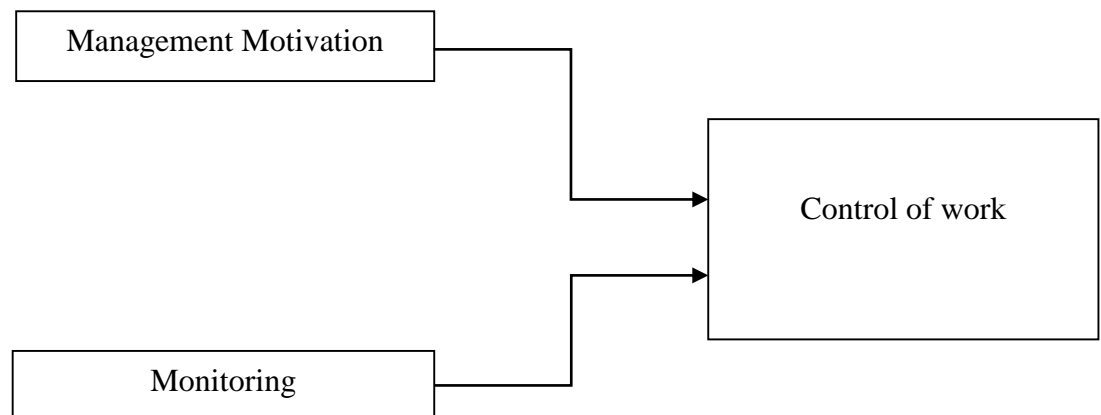


Figure 3.8: Dimension in Control of work variable at the HHO

The dimension, item count and scale of control of work variable are shown in Table 3.2. Furthermore, five points Likert scale has been used to obtain the results. The item count represents the number of questions on the questionnaire.

Table 3.2: Dimension, Item count and Scale of Control of work variable

Variable	Dimension	Item count	Scale
Control of work	Management Motivation	1	Five points Likert scale
	Monitoring of IS	1	Five points Likert scale

3.5.3 Dimensions for Delegation variable

The responsibility and culture are important factors when the delegation variable is considered. Therefore, such dimensions in delegation variable are shown in Figure 3.9.

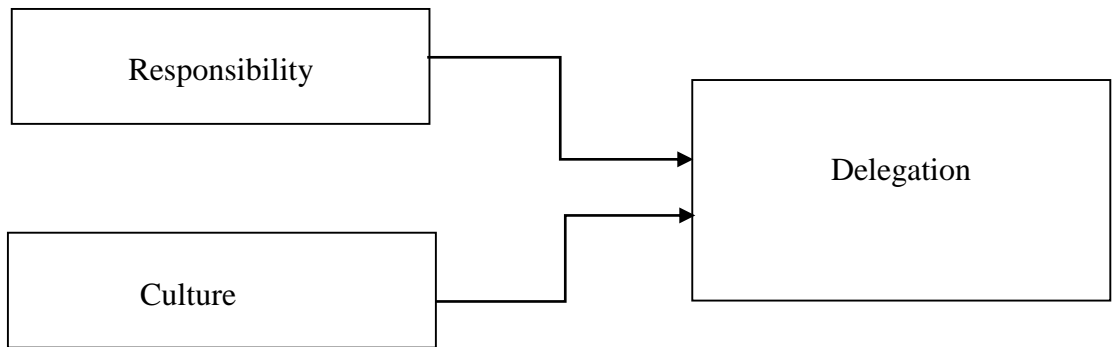


Figure 3.9: Dimension in Delegation variable at the HHO

The dimension, item count and scale of delegation variable are shown in Table 3.3. Furthermore, five points Likert scale has been used to obtain the results. The item count represents the number of questions on the questionnaire.

Table 3.3: Dimension, Item count and Scale of Delegation variable

Variable	Dimension	Item count	Scale
Delegation	Responsibility of employees	1	Five points Likert scale
	Culture of an organization	1	Five points Likert scale

3.5.4 Dimensions of Co-operation variable

The efficient communication and best practices are important factors when considered with the co-operation variable. Therefore, such dimensions in co-operation variable are shown in Figure 3.10.

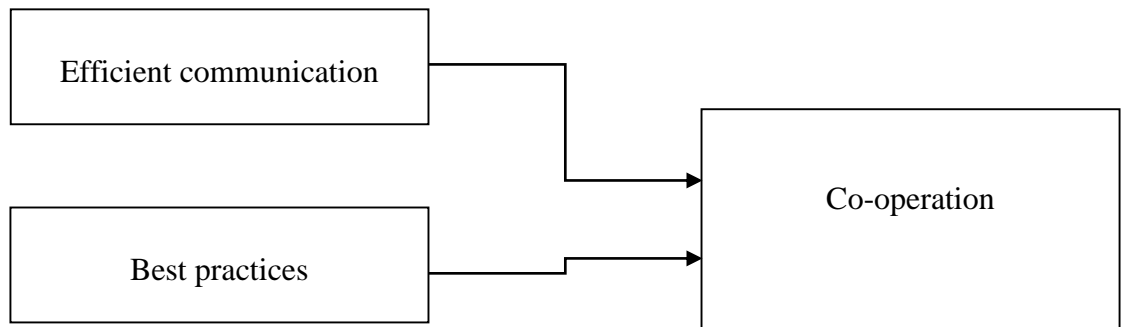


Figure 3.10: Dimension in Co-operation variable at the HHO

The dimension, item count and scale of the co-operation variable are shown in Table 3.4. Furthermore, five points Likert scale has been used to obtain the results. The item count represents the number of questions on the questionnaire.

Table 3.4: Dimension, Item count and Scale of Co-operation variable

Variable	Dimension	Item count	Scale
Co-operation	Efficient communication	1	Five points Likert scale
	Best practices of IS	1	Five points Likert scale

3.5.5 Dimensions of awareness variable

The training, quality measurement and employee disciplines are important factors when considered with the awareness variable. Therefore, such dimensions in awareness variable are shown in Figure 3.11. The dimension, item count and scale of the awareness variable are shown in Table 3.5. Furthermore, five points Likert scale has been used to obtain the results. The item count represents the number of questions on the questionnaire.

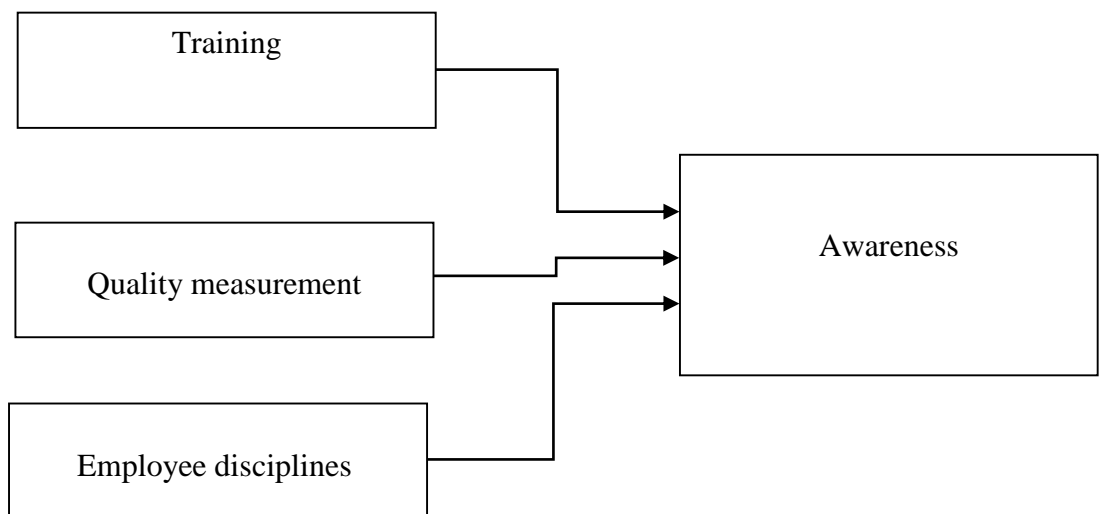


Figure 3.11: Dimension in Awareness variable at the HHO

Table 3.5: Dimension, Item count and Scale of Awareness variable

Variable	Dimension	Item count	Scale
Awareness	Training of employees	1	Five points Likert scale
	Quality measurement of IS	1	Five points Likert scale
	Employee disciplines of IS	1	Five points Likert scale

3.5.6 Dimensions for attitude variable

The knowledge, responsiveness, flexibility and quality maintenance are important factors when considered with the attitude variable. Therefore, such dimensions in attitude variable are shown in Figure 3.12. The dimension, item count and scale of the attitude variable are shown in Table 3.6. Furthermore, five points Likert scale has been used to obtain the results. The item count represents the number of questions on the questionnaire.

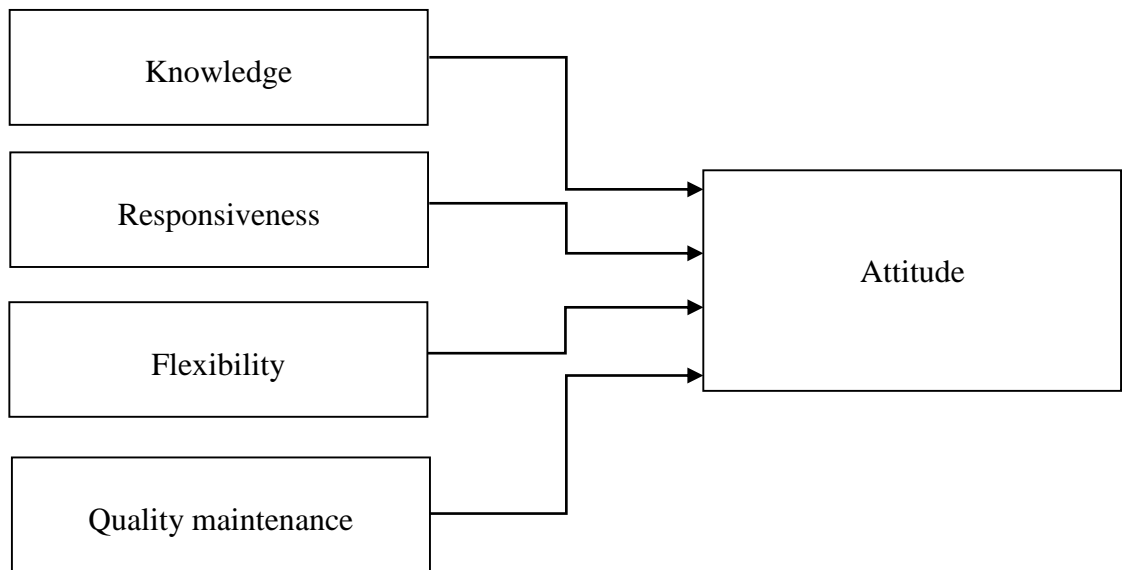


Figure 3.12: Dimension in Attitude variable at the HHO

Table 3.6: Dimension, Item count and Scale of Attitude variable

Variable	Dimension	Item count	Scale
Attitude	Knowledge of IS	1	Five points Likert scale
	Responsiveness of employees	1	Five points Likert scale
	Flexibility of employees	1	Five points Likert scale
	Quality maintenance for IS	1	Five points Likert scale

3.6 Research Instrumentation

The research was carried out using a self-administered questionnaire which was answered by the respondents themselves without the researcher's intervention. The Likert scale shown in Figure 3.13 has been used with summarizations and averages taken into consideration.

3.6.1 Data Collection

The quantitative approach was used to gather data due to the large population, which exists in the HHO. An online questionnaire was used to collect the data as the primary data collection method. Articles, journals and e-books have been used as secondary data collection sources for this research study.

The questionnaire is based on the factors which were gathered from the factor table. Only those factors that were deemed to be important, frequent and most appropriate were considered. Figure 3.2 shows the dependent and independent variables and their relationships in the theoretical framework of this research study. The questionnaire covers the above mentioned hypotheses derived based on the theoretical framework. Each hypothesis was covered by at least two individual questions. The questionnaire can be divided into two categories, namely, a positively rated questionnaire and a negatively rated questionnaire.

3.6.2 Scale

As shown in Figure 3.13, the Likert scale includes a positively rated questionnaire and carries a rating from 1 to 5 values. Apart from questions based on the variables, additional questions were asked to gather demographic information.

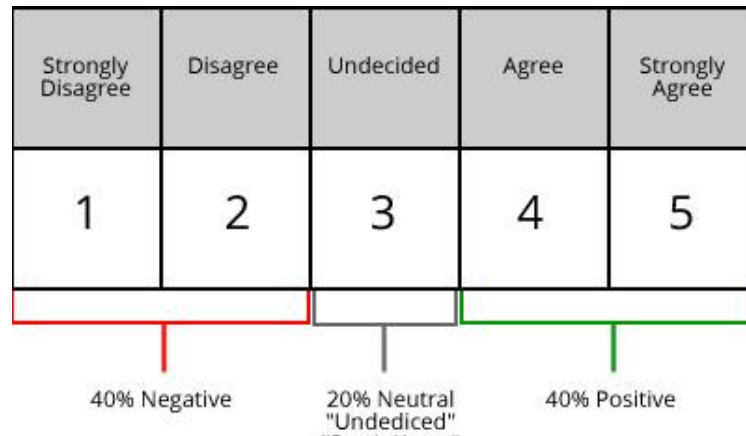


Figure 3.13: Likert Scale

Initially, a draft questionnaire was distributed among three participants, including an IT officer, IT soldier and IT civil worker as a pilot test. The results of this feasibility study was successful and delivered positive feedback for the continuation of such methodology for data collection.

3.6.3 Sample Selection

Based on the findings of Krejcie & Morgan (1970), a small sampling technique was used to determine the sample size for this research.

- S = $X^2 NP (1-P) / d^2 (N-1) + X^2 P (1-P)$
- S = $(3.841)^2 * 300 * 0.50 (1-0.50) / (.05)^2 * (300-1) + (3.841)^2 * 0.50 * (1-0.50)$
- S = 169
- S = Required sample size
- X² = The table value of chi-square for 1 degree of freedom at the desired confidence level (3.841)
- N = Population size (300)
- P = The population proportion (assumed to be 0.50 since this would provide the maximum sample size)
- d = The degree of accuracy expressed as a proportion (0.05)

Although the population in the HHO IT department is 300 and the sample size is 169 employees, the confidence level is 95% and the margin of error is 5%. The population consists of IT department personnel who work in different locations on IT-related tasks. The questionnaire was given to IT officers, IT soldiers and civil workers via online forms. The selection of the population was carried out based on their knowledge of IT and their role in the organization in relation to IT.

3.6.4 Survey

The online questionnaire survey was used as the main data collection method. The letter shown in Appendix C was prepared and distributed to the relevant employees, in order to make them aware of the purpose of this research and to obtain their feedback accordingly. Employees of the HHO IT department were given two weeks to complete the questionnaire. The data were collected through online forms and was exported to the MS Excel format for the analysis.

3.6.5 Data Analysis tools used

The Statistical Package for the Social Sciences (SPSS) is widely used for statistical analysis in research programs and the same is used as the tool for data analysis. The graphical user interface of SPSS analysis presents a user-friendly environment.

MS Excel which is a common, widely used and reliable statistical analysis tool was used to record the objectives. The SPSS and MS Excel together were used for the data analysis and graphical presentation of results.

3.7 Summary

The research design focuses only on the human factor. A self-administered questionnaire was used for gathering data from employees who have a high level of literacy in using computers for their day-to-day work. This research has used a case based approach with quantitative techniques due to the existence of a large population. The theoretical framework (Figure 3.2) shows the hypothesized relation to the independent variables and the dependent variable. The research instrument used was a self-administered questionnaire (online survey questionnaire) with the Likert scale (Figure 3.3). All 300 IT division employees in the HHO were selected as the population and 169 were selected as a sample. The questionnaire used has both positive and negative ranked questions. Appendix “A” shows the questionnaire with the related independent variables.

4. DATA ANALYSIS

4.1 Introduction

The main objective of the data analysis was to obtain the results of the relationships of factors selected for the theoretical framework in order to prepare recommendations and the conclusion of the research thesis. Five methods were used to analyze the data that was collected through the questionnaire using a sample size appropriate to the total population. The data were collected from personnel of the IT department of the HHO. The SPSS tool was used for analyzing the data in the research analysis. Details of the five methods of analysis are given below.

The data analysis was carried out methodically in order to achieve the following objectives:

- Demographic analysis to determine if the sample is representative of the population.
- Reliability analysis to determine the internal consistency of the research instrument, namely the questionnaire used for gathering data.
- Pearson correlation analysis to determine the existence and significance of the relationship between individual factors.
- ANOVA analysis to determine the existence and significance of the relationship between groups of factors.
- Regression analysis to determine a ranked order of significance for a set of relationships.

4.2 Demographic Analysis

The main objective of the demographic analysis is to see whether the research sample matches the population. Microsoft word forms were used to obtain the responses in the demographic analysis and to prepare graphs of the demographic data.

Initially, the demographic analysis method studied the educational qualifications of the employees in the HHO IT department, the distribution of which is shown in Figure 4.1.

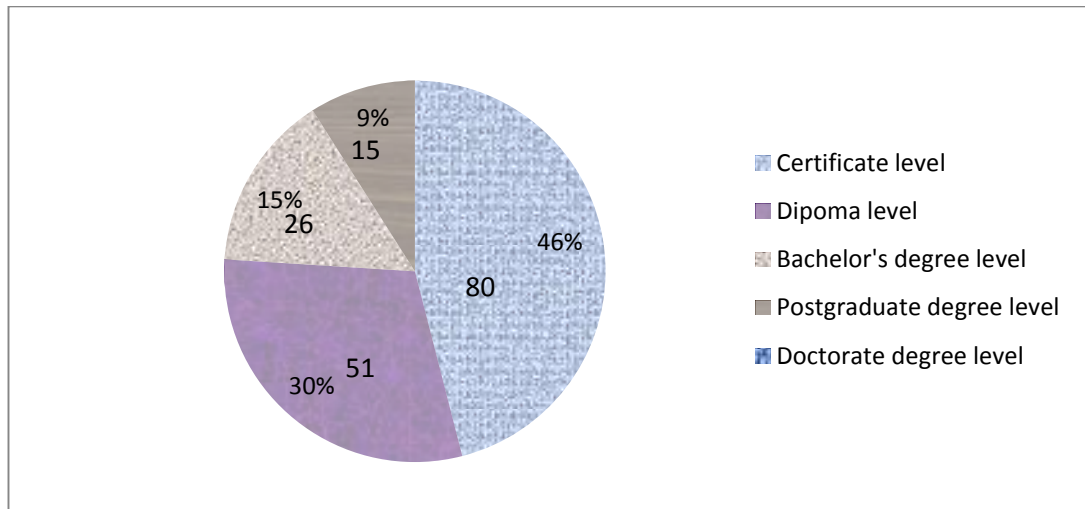


Figure 4.1: Demographic Analysis of Qualifications

As shown in Figure 4.1, 80 employees (46%) have only a certification level qualification and 30% of employees have a Diploma level qualification, while 15% have a degree level qualification. Only 9% of employees have a post-graduate level qualification. These variations in the sample ensure a more accurate result in the research.

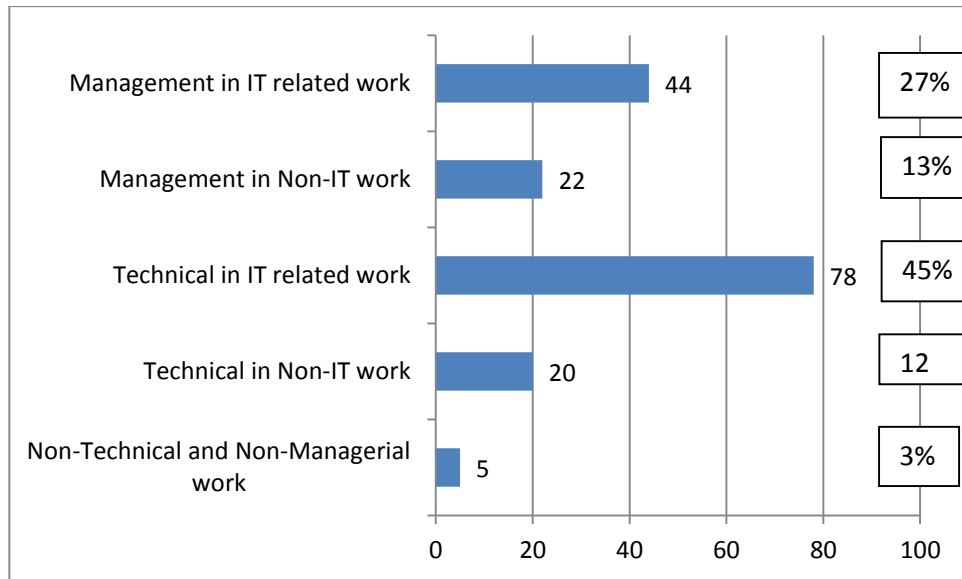


Figure 4.2: Demographic Analysis of Employment Roles

As shown in Figure 4.2, most of the employees (45%) are deployed in technical job roles and another significant segment (27%) is deployed in IT management related job roles. These two job roles which account for 72% of the total number of employees, significantly and directly affect IS-related issues. Therefore, these two groups are the key stakeholders in the application of IS standards.

The age range of the employees is another important factor to be analyzed in this context.

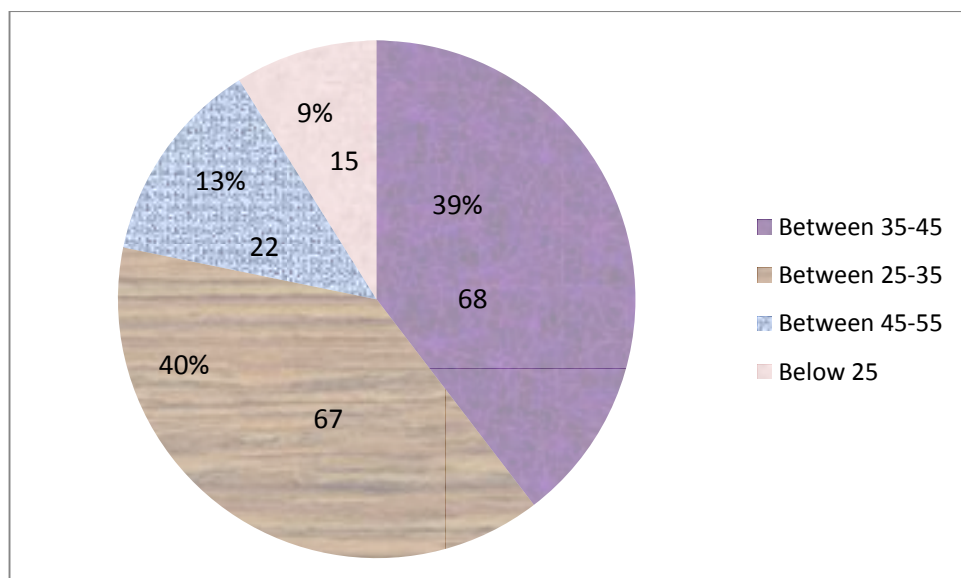


Figure 4.3: Demographic Age Analysis of the Employees

According to Figure 4.3, most of the employees are in the age range of 35-45 years. The secondary age range is 25-35 years. These results show that most of the employees in the HHO IT department are in the middle age groups.

4.3 Reliability Analysis

The main objective of the reliability analysis is to check the internal consistency of the research instrument, which is the questionnaire. The Cronbach's alpha coefficient analysis was used to analyze the reliability analysis in five independent variables and one dependent variable as shown as in Table 4.1. The questionnaire is divided among five independent variables and one dependent variable to measure the reliability of the analysis.

Table 4.1: Reliability Analysis uses Cronbach's Alpha

Variable	No of Items	Cronbach's Alpha
Control of work	5	0.702
Delegation	5	0.780
Co-operation	4	0.784
Awareness	5	0.782
Attitudes	3	0.773
Successful achievement of the IS in an HHO	3	0.724

Table 4.2 : Cronbach's Alpha Value Levels

Cronbach's Alpha	Internal Consistency
0.9 <= a	Excellent
0.8 <= a < 0.9	Good
0.7 <= a < 0.8	Acceptable
0.6 <= a < 0.7	Questionable
0.5 <= a < 0.6	Poor
a < 0.5	Unacceptable

Source: (Gliem & Gliem, 2003)

According to Table 4.1, the independent and dependent variables have more than 0.7 Cronbach's alpha ratios. This reflects a good internal consistency of the research questionnaire.

The control of work (Table 4.5), delegation (Table 4.7), co-operation (Table 4.6), awareness (Table 4.4) and attitudes (Table 4.3) have Cronbach's alpha values 0.702, 0.780, 0.784, 0.782 and 0.773 respectively. Hence, they have very good internal consistency. The dependent variable named: the successful achievement of the IS in an HHO, consists of 0.724 values and also has a very good internal consistency.

Table 4.3: Reliability Analysis of the Attitude Variable

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.773	.771	3

a. Predictor: (Constant) – Attitude

b. Dependent - Successful achievement of the IS in an HHO

c. The result – The value is 0.773 and has an acceptable level of internal consistency

Table 4.4: Reliability Analysis of the Awareness Variable

Reliability Statistics		
Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.782	.785	5

a. Predictor: (Constant) – Awareness
b. Dependent - Successful achievement of the IS in an HHO
c. The result – The value is 0.782 and has an acceptable level of internal consistency

Table 4.5: Reliability Analysis of the Control Variable

Reliability Statistics		
Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.702	.724	5

a. Predictor: (Constant) – Control of work
b. Dependent - Successful achievement of the IS in an HHO
c. The result – The value is 0.702 and has an acceptable level of internal consistency

Table 4.6: Reliability Analysis of the Co-operation Variable

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.784	.782	4

a. Predictor: (Constant) – Co-operation
b. Dependent - Successful achievement of the IS in an HHO
c. The result – The value is 0.784 and has an acceptable level of internal consistency

Table 4.7: Reliability Analysis of the Delegation Variable

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.780	.783	5

a. Predictor: (Constant) – Delegation
b. Dependent - Successful achievement of the IS in an HHO
c. The result – The value is 0.780 and has an acceptable level of internal consistency

4.4 Correlation Analysis

The main objective of the correlation analysis is to determine the relationship between the research variables. The first method is to determine the relationship of

one variable with another. The second method is to determine the relationships of multiple variables with another variable. The third method is to determine the relationships of multiple variables with other multiple variables. According to the three main methods mentioned above, the correlation analysis can be divided into the Pearson correlation and ANOVA. For this research, the relationship of one variable with another variable as well as the relationship of multiple variables with another variable was analyzed to determine correlations.

4.4.1 Pearson Correlation Analysis

The objective of the Pearson correlation is to analyze the relation of one variable with another variable. Each independent variable is analyzed with the dependent variable and the P-value is taken into consideration as shown in Table 4.8.

Table 4.8: Pearson Correlation Analysis

	Control of work	Delegation	Co-operation	Awareness	Attitudes
Successful achievement of IS in an HHO	0.578	0.586	0.713	0.794	0.814
P Value	<0.01	<0.01	<0.01	<0.01	<0.01

According to Table 4.8, co-operation (Table 4.12), awareness (Table 4.10) and attitudes (Table 4.9) have a high correlation with the dependent variable, named the successful achievement of IS in an HHO.

The control of work (Table 4.11) and delegation (Table 4.13) variables have a moderate correlation with the dependent variable.

Table 4.9: Attitude with Dependent Variables Analysis

		ATTITUDE	DEPENDENT
ATTITUDE	Pearson Correlation	1	.814**
	Sig. (2-tailed)		.000
	N	169	169
DEPENDENT	Pearson Correlation	.814**	1
	Sig. (2-tailed)	.000	
	N	169	169

a. Predictor: (Constant) – Attitude

b. Dependent - Successful achievement of the IS in an HHO

c. The result – The value is 0.814 and has a strong positive correlation with the dependent factor

Table 4.10: Awareness with Dependent Variables Analysis

		AWARENESS	DEPENDENT
AWARENESS	Pearson Correlation	1	.794**
	Sig. (2-tailed)		.000
	N	169	169
DEPENDENT	Pearson Correlation	.794**	1
	Sig. (2-tailed)	.000	
	N	169	169

a. Predictor: (Constant) – Awareness

b. Dependent - Successful achievement of the IS in an HHO

c. The result – The value is 0.794 and has a strong positive correlation with the dependent factor

Table 4.11: Control of work with Dependent Variables Analysis

		CONTROL	DEPENDENT
CONTROL	Pearson Correlation	1	.578**
	Sig. (2-tailed)		.000
	N	169	169
DEPENDENT	Pearson Correlation	.578**	1
	Sig. (2-tailed)	.000	
	N	169	169

a. Predictor: (Constant) – Control of work

b. Dependent - Successful achievement of the IS in an HHO

c. The result – The value is 0.578 and has a moderate positive correlation with the dependent factor

Table 4.12: Co-operation with Dependent Variables Analysis

		COOPERATION	DEPENDENT
COOPERATION	Pearson Correlation	1	.713**
	Sig. (2-tailed)		.000
	N	169	169
DEPENDENT	Pearson Correlation	.713**	1
	Sig. (2-tailed)	.000	
	N	169	169

a. Predictor: (Constant) – Co-operation

b. Dependent - Successful achievement of IS in an HHO

c. The result – The value is 0.713 and has a strong positive correlation with the dependent factor

Table 4.13: Delegation with Dependent Variables Analysis

		DELEGATION	DEPENDENT
DELEGATION	Pearson Correlation	1	.586**
	Sig. (2-tailed)		.000
	N	169	169
DEPENDENT	Pearson Correlation	.586**	1
	Sig. (2-tailed)	.000	
	N	169	169

a. Predictor: (Constant) – Delegation

b. Dependent - Successful achievement of IS in an HHO

c. The result – The value is 0.586 and has a moderate positive correlation with the dependent factor

4.4.2 ANOVA Analysis

The main objective of the ANOVA is to analyze multiple variables with other multiple variables or one variable with multiple variables, to identify the correlation between the variables.

Table 4.14: ANOVA Analysis

	Control of work + Delegation + Co-operation + Awareness + Attitude
Successful achievement of IS in an HHO	0.764

The SPSS results are shown in Table 4.15.

Table 4.15: Independent Variable with Dependent Variables Analysis

		Correlations	
		INDEPENDENT	DEPENDENT
INDEPENDENT	Pearson Correlation	1	.764**
	Sig. (2-tailed)		.000
	N	169	169
DEPENDENT	Pearson Correlation	.764**	1
	Sig. (2-tailed)	.000	
	N	169	169

a. Predictors: (Constant) – Control of work + Delegation + Co-operation + Awareness + Attitude
b. Dependent - Successful achievement of IS in an HHO
c. The result – The value is 0.764 and has a strong positive correlation with dependent factor

The independent variables were analyzed with the dependent variable to obtain the result of correlations as shown in Table 4.14. According to this, all variables, namely: control of work, delegation, co-operation, awareness and attitudes, have a high level of correlation with the dependent variable named: Successful achievement of IS in an HHO (Table 4.15).

4.5 Regression Analysis

The objective of the regression analysis is to analyze the relative importance of the five factors found in the literature. This research analyzed one factor with the other four factors and measured how these are influenced. It also determined the factor which causes the highest impact among the four other factors. It gives a more accurate value to the end-user.

Table 4.16: Regression Analysis

Variable	R Square
Control of work	0.334
Delegation	0.343
Co-operation	0.509
Awareness	0.631
Attitudes	0.663

According to Table 4.16, the R square values of control of work (Table 4.17) and delegation (Table 4.18) are low, compared to the other variables and reflect a moderate correlation. The attitude variable has the highest impact on the result of this research. The SPSS results are given in Table 4.17 and Table 4.18.

Table 4.17: Regression Analysis of the Control of Work Variable

Model Summary		
R Square	Adjusted R Square	Std. Error of the Estimate
.334	.330	1.316

The result – The value is 0.334 and has a low impact on the end result

Table 4.18: Regression Analysis of the Delegation Variable

Model Summary		
R Square	Adjusted R Square	Std. Error of the Estimate
.343	.339	1.307

The result – The value is 0.343 and has a low impact on the end result

4.6 Summary

The first result of the demographic qualification data analysis is shown in Figure 4.1. Most of the employees (46%) have only a certification level qualification and 30% of the employees have a diploma-level qualification, while 15% have a degree level qualification. Only 9% of the employees have a post-graduate level qualification. The qualification variation clearly identifies the employees of the organization, according to the hierarchy from bottom to top.

The second result of the demographic job description data analysis is shown in Figure 4.3. A majority (45%) of employees is deployed in technical IT-related work, while 27% are in IT management. The variations in the qualification levels correspond to employees' position in the HHO IT department from bottom to top.

The result of the demographic age data analysis is shown in Figure 4.5. Most of the employees are in the age range of 35-45 years. The secondary age range is 25-35 years. The age range differs according to the hierarchical levels and experience of employees within the organization.

The result of the reliability analysis is shown in Table 4.1. The control of work, delegation, cooperation, awareness and attitude variables have Cronbach's alpha, respectively at 0.702, 0.780, 0.784, 0.782 and 0.773. Hence, these variables have very good internal consistency. The dependent variable named: Successful achievement of IS in an HHO, has an indicated value of 0.724 and has very good internal consistency.

The result of the Pearson correlation analysis is shown in Table 4.3. The variables: cooperation, awareness and attitudes have a high correlation with the dependent variable named: Successful achievement of IS in an HHO. The variables: control of work and delegation has a moderate correlation with the dependent variable. The main guidelines can be developed by using the co-operation, awareness and attitudes factors when considering the results of the correlations among the variables.

The result of the ANOVA is shown in Table 4.4. The variables named control of work, delegation, cooperation, awareness and attitudes have a high correlation with

the dependent variable named: Successful achievement of IS in an HHO. Guidelines can be adopted using all the factors because they have a high correlation in the successful achievement of IS in an HHO.

The result of the regression analysis is shown in Table 4.5. The R square values of control of work and delegation are low compared to the other variables, and carry a lower impact in the correlations. Therefore, the control of work and delegation factors can be moderately considered when creating the guidelines, because these variables have a lesser impact on the successful achievement of IS in an HHO.

5. CONCLUSION

5.1 Introduction

The main objective of this research is to determine the human factors which affect the successful achievement of IS in HHO.

As per the results shown in Chapter 4, Table 4.7, the co-operation, awareness and attitude factors of the employees have a high correlation in the successful achievement of IS in an HHO. Hence, those human factors are considered as having a positive effect on the successful achievement of IS in HHO.

The control of work and delegation factors are correlated moderately in the successful achievement of the IS in an HHO as shown in Tables 4.10 and 4.12.

The co-operation, awareness, attitude, control of work and delegation variables together has a high correlation in the successful achievement of IS in an HHO as shown in Chapter 4, Table 4.13.

Employee attitude was identified as the most valuable asset and which can easily be used in the achievement of IS in an HHO as shown in the results of Chapter 4, Table 4.8.

Finally, the most effective human factors for achieving effective IS in HHO were identified as Co-operation, Awareness and Attitude.

The HHO should address these positively correlating human factors in order to increase IS.

Furthermore, guidelines were prepared by using the above listed most effected human factors with the incorporation of industry best practices.

5.2 Industry Best Practices to use as Guidelines

The following guidelines have been prepared using human factors selected through the findings of this research and integrating with the industry best practices for achieving of IS in an HHO.

- E-mail to be used by hierarchical level personnel to communicate official documents within the organization in an efficient manner, according to the result of Chapter 4, Table 4.11.
- Implement file transactions through password-protected computer systems using relevant file transfer protocols, according to the result of Chapter 4, Table 4.8.
- Conduct training for employees about the computer systems, IS and arrange a user help desk support service with the goal of increasing employee awareness, according to the result of Chapter 4, Table 4.9.
- Prepare a user manual for IS awareness methods for users, IT managers and top-level managers to upgrade the knowledge and increase the awareness of employees, according to the result of Chapter 4, Table 4.9.
- Conduct frequent knowledge sharing sessions for employees regarding new technologies, vulnerabilities and the protection of computer systems from the theft and third parties in order to increase employee awareness, according to the result of Chapter 4, Table 4.9.
- Align the vision for IS with the HHO's vision in order to provide efficient and reliable service to its users and to increase employee attitude levels, according to the result of Chapter 4, Table 4.8.
- Conduct hands-on training and awareness programs for the employees regarding benefits of the achievement of IS in an HHO, according to the results of Chapter 4, Table 4.9.
- Management should educate and encourage subordinates to have a positive attitude about the success of implementing information security standards, according to the results of Chapter 4, table 4.8.

5.3 Conclusion

The results of this research provide important insights into the human factors that affect the successful achievement of IS in an HHO. Furthermore, three human factors have been identified to be highly positively correlated to the successful achievement of IS in the HHO. The research proposes a set of guidelines by using industry best practices that correlate with identified human factors to improve the efficiency and effectiveness of the same. These guidelines will benefit the HHO by increasing the quality, reliability and efficiency of the information security service. Successful adherence to these guidelines will mitigate risk and vulnerabilities, and will enable the successful achievement of IS.

5.4 Summary

The most effective human factors (co-operation, awareness and attitude) have been identified in the research to use as further development strategies in the IS of HHO. IS best practices which are currently used in the industry are also presented as guidelines together with the research findings.

The co-operation, awareness and attitude factors of the employees have high effectiveness in the "Successful achievement of IS in an HHO". Furthermore, the employee attitude was identified as the most valuable asset which can easily be used in the achievement of IS in an HHO.

Hence, according to the above results, the use of above best practices as guidelines in the achievement of the IS in an HHO will increase the quality, reliability and efficiency in service delivery through the elimination of the IS obstacles in the organization.

5.5 Challenges & Limitations

There were many challenges and limitations encountered in this research study.

- Difficulty in convincing the senior management - Due to the lack of knowledge about the importance of IS and their reluctance to change existing behavior, the senior management always tends to postpone the application of

IS best practices. This could be eliminated by providing comprehensive knowledge of IS through training.

- The research was narrowed down to human factors as it was the most significant and important factor, among other technological, organizational and regulatory factors. Also, the research scope was limited to an HHO IT department. The human factor was considered due to the convenience of data collection and the ease of finding literature, as well as constraints of time, finances etc.
- Difficulty in changing the cultural patterns of the employees who are reluctant to adopt new technology due to lack of understanding of the importance of IS.
- Data collection was done through the use of a population size of 300 employees since IT equipment is being handled only by those employees. This was adopted due to convenience because these employees have a reasonable IQ level and were able to understand and answer the questionnaire. This gave some positive results for the research instrument.
- The scope of this research was limited to an HHO IT department and used a case study based approach for the selection of population and sample size. All employees responsible for IS in the HHO IT department were taken into consideration as the population, but only 169 employees were selected as size of the sample, with intention of minimizing the sampling error.

REFERENCES

- Anttila, J., Jussila, K., Kajava, J., & Kamaja, I. (2012). Integrating ISO/IEC 27001 and other managerial discipline standards with processes of management in organizations. In *Seventh International Conference on Availability, Reliability and Security 2012* (pp. 425-436). IEEE.
- Asosheh, A., Dehmoubed, B., & Khani, A. (2009). A new quantitative approach for information security risk assessment. In *2nd IEEE International Conference on Computer Science and Information Technology, 2009 (ICCSIT 2009)* (pp. 222-227). IEEE.
- Barlette, Y., & Fomin, V. V. (2008). Exploring the suitability of IS security management standards for SMEs. In *Proceedings of the 41st Annual Hawaii International Conference on System Sciences (HICSS 2008)* (pp. 308-308). IEEE.
- Beckers, K., Faßbender, S., Heisel, M., & Schmidt, H. (2012). Using security requirements engineering approaches to support ISO 27001 information security management systems development and documentation. In *Seventh International Conference on Availability, Reliability and Security 2012* (pp. 242-248). IEEE.
- Boehmer, W. (2008). Appraisal of the effectiveness and efficiency of an information security management system based on ISO 27001. In *Second International Conference on Emerging Security Information, Systems and Technologies 2008* (pp. 224-231). IEEE.
- Bray, D. A. (2006). Exploration, exploitation, and knowledge management strategies in multi-tier hierarchical organizations experiencing environmental turbulence. In *North American Assoc. for Computational Social and Organizational Science (NAACSOS) Conference 2006* (pp. 1-6). Springer.
- Cai, N., Wang, J., & Yu, X. (2008). SCADA system security: Complexity, history and new developments. In *6th IEEE International Conference on Industrial Informatics 2008* (pp. 569-574). IEEE.
- Cosic, Z., & Boban, M. (2010). Information security management-Defining approaches to Information Security policies in ISMS. In *8th International Symposium on Intelligent Systems and Informatics (SISY), 2010* (pp. 83-85). IEEE.
- Crawford, K., Hasan, H. M., Warne, L., & Linger, H. (2009). From traditional knowledge management in hierarchical organizations to a network-centric paradigm for a changing world. *Emergence: Complexity and Organization*, 11 (1), (pp. 1-18). Springer.
- Dey, M. (2007). In *Information security management-a practical approach (AFRICON 2007)* (pp. 1-6). IEEE.

- Dupuis, M. J., Crossler, R. E., & Endicott - Popovsky, B. (2016). Measuring the human factor in information security and privacy. In 49th Hawaii International Conference on System Sciences (HICSS) 2016 (pp. 3676-3685). IEEE.
- Fazlida, M. R., & Said, J. (2015). Information security: Risk, governance and implementation setback. *Procedia Economics and Finance*, 28, (pp. 243-248). Elsevier
- Fenz, S., Neubauer, T., Accorsi, R., & Koslowski, T. (2013). FORISK: Formalizing information security risk and compliance management. In 43rd Annual IEEE/IFIP Conference on Dependable Systems and Networks Workshop (DSN-W) 2013 (pp. 1-4). IEEE.
- Greenberg, S., Mills, E., Tschudi, B., Rumsey, P., & Myatt, B. (2006). Best practices for data centers: Lessons learned from benchmarking 22 data centers. *Proceedings of the ACEEE Summer Study on Energy Efficiency in Buildings in Asilomar, CA*. ACEEE, August, 3, (pp. 76-87). ACEEE.
- Gliem, J. A., & Gliem, R. R. (2003). Calculating, interpreting, and reporting Cronbach's alpha reliability coefficient for Likert-type scales. *Midwest Research-to-Practice Conference in Adult, Continuing, and Community Education*. Elsevier.
- Hajdarevic, K., Allen, P., & Spremic, M. (2016). Proactive security metrics for bring your own device (BYOD) in ISO 27001 supported environments. In 24th Telecommunications Forum (TELFOR) 2016 (pp. 1-4). IEEE.
- Haufe, K., Colomo-Palacios, R., Dzombeta, S., Brandis, K., & Stantchev, V. (2016). ISMS core processes: A study. *Procedia Computer Science*, 100, (pp. 339-346). Elsevier.
- Haufe, K., Colomo-Palacios, R., Dzombeta, S., Brandis, K., & Stantchev, V. (2016). Security management standards: mapping. *Procedia Computer Science*, 100, (pp. 755-761). Elsevier.
- Hsu, C., Wang, T., & Lu, A. (2016). The Impact of ISO 27001 certification on firm performance. In 49th Hawaii International Conference on System Sciences (HICSS) 2016 (pp. 4842-4848). IEEE.
- Haque, S. T., Wright, M., & Scielzo, S. (2014). Hierarchy of users 'web passwords: Perceptions, practices and susceptibilities. *International Journal of Human-Computer Studies*, 72 (12), (pp. 860-874). Elsevier.
- Itoh, H. (1992). Cooperation in hierarchical organizations: An incentive perspective. *JL Econ. & Org.*, 8, (pp. 321). Springer.
- Koberg, C. S., & Hood, J. N. (1991). Cultures and creativity within hierarchical organizations. *Journal of Business and Psychology*, 6 (2), (pp. 265-271). Springer.

- Krejcie, R. V., & Morgan, D. W. (1970). Determining sample size for research activities. *Educational and psychological measurement*, 30 (3), (pp. 607-610). Elsevier.
- Knolmayer, G. F., Helfenstein, L. E., Loosli, G., & Disterer, G. W. (2012). Email Governance: Are companies in financial industries more mature? In 45th Hawaii International Conference on System Sciences 2012 (pp. 4992-5001). IEEE.
- Laguna, M. F., Gusman, S. R., Abramson, G., Gonçalves, S., & Iglesias, J. R. (2005). The dynamics of opinion in hierarchical organizations. *Physica A: Statistical Mechanics and its Applications*, 351 (2-4), (pp. 580-592). Elsevier.
- Merete Hagen, J., Albrechtsen, E., & Hovden, J. (2008). Implementation and effectiveness of organizational information security measures. *Information Management & Computer Security*, 16 (4), (pp. 377-397). Emerald Insight.
- Norman, A. A., & Yasin, N. M. (2009). An analysis of Information Systems Security Management (ISSM): The hierarchical organizations vs. emergent organization. In *International Conference for Internet Technology and Secured Transactions (ICITST) 2009* (pp. 1-8). IEEE.
- Pecina, K., Estremera, R., Bilbao, A., & Bilbao, E. (2011). Physical and Logical Security management organization model based on ISO 31000 and ISO 27001. In *Carnahan Conference on Security Technology 2011* (pp. 1-5). IEEE.
- Pluchino, A., Rapisarda, A., & Garofalo, C. (2011). Efficient promotion strategies in hierarchical organizations. *Physica A: Statistical Mechanics and its Applications*, 390 (20), (pp. 3496-3511). Elsevier.
- Shojaie, B., Federrath, H., & Saberi, I. (2014). Evaluating the effectiveness of ISO 27001: 2013. In *2014 Ninth International Conference on Availability, Reliability and Security* (pp. 259-264). IEEE.
- Shojaie, B., Federrath, H., & Saberi, I. (2015). The Effects of Cultural Dimensions on the Development of an ISMS Based on the ISO 27001. In *10th International Conference on Availability, Reliability and Security 2015* (pp. 159-167). IEEE.
- Spremic, M., Zmirak, Z., & Kraljevic, K. (2008). IT and business process performance management: Case study of ITIL implementation in finance service industry. In *30th International Conference on Information Technology Interfaces (ITI 2008)* (pp. 243-250). IEEE.
- Susanto12, H., Almunawar, M. N., & Tuan, Y. C. (2011). Information security management system standards: A comparative study of the big five. *International Journal of Electrical Computer Sciences IJECSIJENS*, 11(5), (pp. 23-29). Elsevier.

Talib, M. A., Khelifi, A., & Ugurlu, T. (2012). Using ISO 27001 in teaching information security. In 38th Annual Conference on IEEE Industrial Electronics Society (IECON 2012) (pp. 3149-3153). IEEE.

Witus, G. (1986). Decision support for planning and resource allocation in hierarchical organizations. IEEE transactions on systems, man, and cybernetics, 16 (6), (pp. 927-942). IEEE.

APPENDIX A: A LIST OF QUESTIONS

The rest of the questionnaire was evaluated using the scale given below.

1 – Strongly agree

2 – Agree

3 – Moderately agree

4 – Disagree

5 – Strongly disagree

Given below is the **demographic section of the questionnaire:**

01 What is the highest educational qualification level you have completed?

- a) Certification level
- b) Diploma level
- c) Bachelor's degree level
- d) Postgraduate degree level
- e) Doctoral degree level

02 What is your current employment role? Tick all that apply:

- a) Management in IT-related work
- b) Management in Non-IT work
- c) Technical in IT-related work
- d) Technical in Non-IT work
- e) Nontechnical and Non-Managerial work

03. What is your age?

- a) Below 25
- b) Between 25 - 35
- c) Between 35 - 45
- d) Between 45 - 55
- e) Above 55

The other questions in the questionnaires were prepared according to the variables found in the literature.

Control of work –

04 Our section head has encouraged us to use the virus guard when connecting the external devices to our computers.

- Strongly agree
- Agree
- Moderately agree
- Disagree
- Strongly disagree

05 Policies and procedures have been implemented to protect the computerized information in our organization.

- Strongly agree
- Agree
- Moderately agree
- Disagree
- Strongly disagree

Delegation –

- 06 When my superior is not available, I am able to check and edit the superior related work in the computer system using my username and password.
- Strongly agree
 - Agree
 - Moderately agree
 - Disagree
 - Strongly disagree
- 07 The work culture of our organization allows me to grant the opportunity for my subordinates to view and edit the details of the computer system using their usernames and passwords.
- Strongly agree
 - Agree
 - Moderately agree
 - Disagree
 - Strongly disagree

Co-operation –

- 08 I am allowed to communicate well with my supervisor, regarding the information security matters.
- Strongly agree
 - Agree
 - Moderately agree
 - Disagree
 - Strongly disagree
- 09 Our organization uses industry-recognized intelligence technique for the protection of our computerized information from the vulnerable third party.
- Strongly agree
 - Agree
 - Moderately agree
 - Disagree
 - Strongly disagree

Attitude –

- 10 I have a positive belief about "How to secure the computer-related information" in our organization.
- Strongly agree
 - Agree
 - Moderately agree
 - Disagree
 - Strongly disagree
- 11 I always stand to adhere to the instruction given by the supervisor, which regarding the security of our computerized information.
- Strongly agree
 - Agree
 - Moderately agree
 - Disagree
 - Strongly disagree
- 12 I had a mood working extended hours for improving the information security in our computer systems.
- Strongly agree
 - Agree
 - Moderately agree
 - Disagree
 - Strongly disagree
- 13 I always in a position to work hard to improve the quality of our data (by double-checking) the entered record to the computer system.
- Strongly agree
 - Agree
 - Moderately agree
 - Disagree
 - Strongly disagree

Awareness –

- 14 I have participated in enough training regarding protecting the valuable information on our computer system by the third-party vulnerabilities.
- Strongly agree
 - Agree
 - Moderately agree
 - Disagree
 - Strongly disagree

- 15 I haven't done any misuse with the information, which is stored in our computer systems.
- Strongly agree
 - Agree
 - Moderately agree
 - Disagree
 - Strongly disagree

Dependent variable - Successful achievement of information security for a highly hierarchical organization.

- 16 By applying the information security in our organization, more advantages have been gained when compared to other organizations, which are affected by the virus attacks.
- Strongly agree
 - Agree
 - Moderately agree
 - Disagree
 - Strongly disagree
- 17 Each user has a password for the computer systems and separate physical identification ID. This information has helped to protect our information from misuse.
- Strongly agree
 - Agree
 - Moderately agree
 - Disagree
 - Strongly disagree
- 18 Policies and procedures of our organization immensely helped to protect the information security in our institution.
- Strongly agree
 - Agree
 - Moderately agree
 - Disagree
 - Strongly disagree

APPENDIX B: REQUEST LETTER

Dear Sir/Madam/Senior Officers/Officers/Sailors/Civil staff,

This is to inform you that I plan to carry out a survey in order to gather information to determine the human factors affecting and to prepare guidelines for the application of the information security in the Sri Lanka Navy IT department.

I kindly request you to provide the appropriate answers to the questionnaire given below. Your participation in this research questionnaire is greatly appreciated.

If you have any queries or wish to know any other information regarding this, please feel free to contact me.

I thank you for your time and for helping me to make this research a success.

Sincerely,

R. M. K. B. Rajapaksha

Mobile: 0713564148

kanchana.16@cse.mrt.ac.lk

APPENDIX C: FACTOR TABLE

SR.NO	YEAR	TITLE	HUMAN FACTORS				
			Control of Work	Delegation	Cooperation	Awareness	Attitudes
1	1986	Decision Support for Planning and Resource	1	1			1
2	1951	Regulation and Control in Hierarchical Organizations	1	1	1		1
3	1991	Cultures and creativity within hierarchical organizations		1	1		1
4	2009	From traditional knowledge management in hierarchical organizations to a network centric paradigm for a changing world	1	1	1	1	1
5	2009	An Analysis of Information Systems Security Management (ISSM): The Hierarchical Organizations vs. Emergent Organization	1	1	1	1	1
6	2006	Exploration, Exploitation, and Knowledge Management Strategies in Multi-Tier Hierarchical Organizations Experiencing Environmental Turbulence	1	1		1	
7	1992	Cooperation in Hierarchical Organizations: An Incentive Perspective	1	1	1	1	1
8	2011	Efficient Promotion Strategies in Hierarchical Organizations	1	1			1
9	2013	The dynamics of opinion in hierarchical organizations	1	1	1		1
10	2008	Implementation and effectiveness of organizational information security measures	1			1	
11	2012	Using Security Requirements Engineering Approaches to Support ISO 27001 Information Security Management Systems Development and Documentation	1	1		1	

12	2012	Using ISO 27001 in Teaching Information Security	1		1	1	
13	2015	The Effects of Cultural Dimensions on the Development of an ISMS Based on the ISO 27001	1	1	1	1	1
14	2016	The Impact of ISO 27001 Certification on Firm Performance	1				
15	2009	A new quantitative approach for information security risk assessment	1		1	1	
16	2008	Appraisal of the effectiveness and efficiency of an Information Security Management System based on ISO 27001	1	1		1	
17	2014	Evaluating the effectiveness of ISO 27001:2013 based on Annex A	1	1		1	
18	2008	Exploring the suitability of IS security management standards for SMEs	1			1	
19	2013	FORISK: Formalizing Information Security Risk and Compliance Management	1		1	1	
20	2007	Information Security Management - A Practical Approach	1	1	1	1	
21	2010	Information Security Management - Defining Approaches to Information Security Policies in ISMS	1	1	1	1	1
22	2011	Information Security Management System Standards: A Comparative Study of the Big Five	1	1	1		
23	2015	Information Security: Risk, Governance and Implementation Setback	1	1	1	1	1
24	2012	Integrating ISO/IEC 27001 and other managerial discipline standards with processes of management in organizations	1	1	1	1	1
25	2016	ISMS core processes: A study	1		1	1	1
26	2008	IT and Business Process Performance Management: Case Study of ITIL Implementation in Finance Service Industry	1		1	1	1
27		PHYSICAL AND LOGICAL SECURITY MANAGEMENT ORGANIZATION MODEL BASED ON ISO 31000 AND ISO 27001	1	1	1	1	
28	2016	Proactive Security Metrics for Bring Your Own Device (BYOD) in ISO 27001 Supported Environments	1	1	1		1
29		SCADA System Security	1		1	1	
30	2016	Security Management Standards: A Mapping	1		1	1	
			29	20	21	22	15