HIGHER EDUCATION INSTITUTIONS INFORMATION SYSTEMS ACQUISITION DECISION MODEL DEVELOPMENT

A Dissertation

Presented to

The Faculty of the College of Graduate Studies

Samar State University

Catbalogan City

In Partial Fulfillment

of the Requirements for the Degree

Doctor of Philosophy (Ph.D.)

Major in **Technology Management**

RODOLFO F. DOLLADO, JR.

March 2017

APPROVAL SHEET

This dissertation entitled **"HIGHER EDUCATION INSTITUTIONS INFORMATION SYSTEMS ACQUISITION DECISION MODEL DEVELOPMENT"** has been prepared and submitted by **RODOLFO F. DOLLADO, JR.**, who having passed the comprehensive examination, is hereby recommended for oral examination.

FELISA E. GOMBA, Ph.D.
Vice President for Academic Affairs
Samar State University
Adviser

Approved by the Committee on Oral Examination on October 7, 2016 with a rating of PASSED.

VICTORIA M. TAFALLA, Ph.D.
Dean, College of Graduate Studies, SSU
Chairman

SIMON P. BABALCON, JR., Ph.D.
President Emeritus, SSU
Member

RONALD L. ORALE, Ph.D.
VP for Research and Extension, SSU
Member

JOSE S. LABRO, Ph.D.
VP for Administrative Affairs, SSU
Member

NANCY L. GETALADO, Ph.D.
Dean, College of Information Technology, NwSSU
Member

MARILYN D. CARDOSO, Ph.D.
University President, SSU
Member

Accepted and approved in partial fulfillment of the requirements for the Degree in **Doctor of Philosophy (Ph.D.) major in Technology Management**.

October 7, 2016
Date of Oral Examination

VICTORIA M. TAFALLA, Ph.D.
Dean, College of Graduate Studies, SSU

ACKNOWLEDGMENT

The researcher wishes to convey his sincere and profound gratitude to those whom he is much indebted for the completion of this brainstorming work:

To **Dr. Felisa E. Gomba**, Vice President for Academic Affairs and the researcher's adviser, for unselfishly sharing her expertise in research and for guiding the researcher towards the realization of this work from the proposal making to the completion of this study;

To **Dr. Victoria M. Tafalla**, Dean of the College of Graduate Studies and Chairman of the Committee on Oral Examination, for her encouragement and benevolent assistance which led to the completion of this work;

To the members of the Committee on Oral Examination, **Dr. Simon P. Babalcon, Jr.**, **Dr. Ronald L. Orale**, **Dr. Jose S. Labro**, **Dr. Nancy L. Getalado**, and **Dr. Marilyn D. Cardoso**, for their scholarly perusal of this work and for their positive criticisms, helpful opinions, suggestions, and recommendations which led to the refinement of this study;

To **Dr. Donald M. Patimo**, the researcher's statistician, for sharing his expertise in statistics and for his valuable inputs in the formulation of this study;

To all the **administrators, MIS/IT heads and staff, IT faculty members,** and **employees of HEIs** who served as respondents of this study, for patiently answering the questionnaire and the interview;

Dr. Avelina N. Bergado, President of Northwest Samar State University, for showing support to the researcher by allowing him to be temporarily relieved from his post when he was conducting the study;

To **CIT Family**, headed by **Dr. Nancy L. Getalado**, Dean of CIT, for their pieces of advice, encouragement and support;

To his loving, understanding, and very supportive wife **Malou** and children **Edelweiss**, **Nathan Ciel**, and **Thistle**, for serving as his inspiration;

Above all, to **Lord Almighty**, the Savior and Giver of life, for giving him wisdom, strength and reason to live despite the trials and challenges in life.

DEDICATION

This humble work and simple endeavor of success is dedicated with utmost love and deep appreciation.

To my dear wife and best friend,

Malou

Who remains loving, understanding, and supportive throughout the completion of this endeavor.

To my children,

Edelweiss, Nathan Ciel, and Thistle

For being the reasons of my existence and for serving as precious gems of my life.

To the source of everlasting love and wisdom,

Almighty God

Who continues to make the impossible possible.

DONDON

ABSTRACT

This study aimed to determine the in-house development and outsourcing of the Information System (IS) of the Higher Education Institutions (HEIs) in the island of Samar. This study utilized the descriptive-development method of research that investigated the management strategies and practices in in-house development and outsourcing of information system of the HEIs in the island of Samar. From the finding of the study, the Information System Acquisition Decision Model was developed. This model would help HEIs in the decision-making process for information system acquisition by generating the best acquisition method-either in-house development or outsourcing. For outsourcing, it was revealed that all the management strategies were highly implemented. Among the management strategies, directing earned the highest weighted mean of 3.87 while monitoring and evaluation earned the lowest weighted mean of 3.56. in general, the overall mean of 3.67 implies that the management strategies in outsourcing of information system are conducted well but require a more intensive application to attain complete implementation. In general, the in-house developed and outsourced information system have similar performance because both methods of acquisition have limitation and issues that need to be address. For the recommendation, the proposed Information System Acquisition Decision Model may be utilized by other HEIs as aid in the decision-making process for information system acquisition.

TABLE OF CONTENTS

Chapter 1

THE PROBLEM AND ITS SETTING

<u>Introduction</u>

The development and implementation of effective information systems (ISs) have been the goal for many organizations in their quest to provide more and better information to compete in an increasingly global business environment (Skoumpopoulou & Nguyen-Nwby, 2015: 463). These Information Systems (ISs) are set of interrelated components that collect, manipulate, store, and disseminate data and information and provide feedback mechanism to meet an objective (Stair, et al., 2012: 5). Literature show that many organizations have invested in information systems since these information systems have become essential for conducting day-to-day business as well as achieving strategic business objectives. Business firms invest heavily in information systems to achieve six strategic business objectives: operational excellence; new products, services, and business models; customer and supplier intimacy; improved decision making; competitive advantage; and survival (Laudon & Laudon, 2012: 12).

In the education sector, Higher Education Institutions (HEIs) have recognized the importance of information systems. It has been considered that the growth of Information Systems (IS) has an important role in improving the operations of higher education institutions (Alrawashdeh, et al., 2013: 1). These information systems have become important tools used to perform effective and efficient academic and administrative operations in HEIs. Along this line, Caipang (2013: 143) mentioned that these information systems facilitate enhanced data sharing and proper coordination among departments within the learning institution. Introduction of information systems into the management contour of higher educational institutions aims at the increase of the productivity of daily activities, elimination of their duplication and at the improvement of management efficiency (Sagitova, 2012: 56).

At some point, adoption of information systems are associated to the implementation of quality assurance in HEIs. Kahveci, et al. (2015: 163) cited that information systems should be implemented to integrate the quality assurance system with management processes for enhancing the overall success, and to produce assessable information about quality assurance. The institution-wide application of technology and information systems to quality assurance is a need and an opportunity for universities. The demand of Information Systems had also led to the implementation of Management Information Systems (MIS) in HEIs. MIS is implemented within the higher education setting to support teachers, researchers, administrators, and to automate and control the entire educational process (Phahlane & Kekwaletswe, 2014: 2). The need for Information Systems has further led to many studies that focus on IS integration in the administrative and academic operations of universities and colleges.

In the Philippines, the implementation of information systems in HEIs has been further intensified when the Commission on Higher Education established the Higher Education Management Information System (HEMIS). The HEMIS has been established in support to CHED's mandate "to collect, store and disseminate data and information needed by the public and stakeholders to make informed choices and decisions" (CHED Memorandum Order No. 15, Series of 2013). The HEMIS requires HEIs online submission of forms and reports containing the required data/information via the Commission on Higher Education Collection and Knowledge System (CHECKS).

The above premise on the adoption and implementation of information systems is indeed relevant as they provide value to the administrative and academic functions of HEIs. However, acquisition of information system has become an issue that need to be addressed. This issue denotes the choice or method of acquisition that is appropriate and which could lead to a functional and economical information systems investment. Along this issue, an important question is asked: "Should an HEI design and develop its own information system (build), or should it purchase a pre-made package from an outside software developer (buy)? (Cognizant, 2013: 6). Answering this question requires much brainstorming and research, hence strategic goals underlying business processes and support requirements is necessary.

This above issue on build-or-buy was supported by McManus (2003) when the author stated that the real issue for organizations to address is what methodology is best for their organization. Each organization must decide if it can achieve a true competitive advantage with a traditional in-house system or should they change their business processes with an ERP system. This indicates that there can be many different factors that play into the decision making process of IS acquisition.

In the local setting, the Island of Samar has a good number of established HEIs. These HEIs, both public and private, have embraced information systems over a decade now and have integrated these into their administrative and academic operations. Generally, the integration of IS has produced positive outcomes to HEIs. The said benefits of using IS are evident in some SUCs like Northwest Samar State University and Samar State University which implemented outsourced and developed in-house information systems, respectively. Not only SUCs have adopted and implemented information systems but the private HEIs as well, like Christ the King College and Samar College which have outsourced and in-house developed information systems, respectively.

However, it has been observed that there were notable problems felt by HEIs in making decisions relative to outsourcing and in-house development of their information system. These problems were evident during the interview conducted by the researcher himself.

For HEIs with outsourced systems, the following issues were revealed: HEIs are having difficulty to upgrade the system to meet the immediate need as in the case of the changing requirements of CHED on repots submission; the codes cannot be easily modified due to being under contract; the system is a template-based system and so it is not easy to redesign said system in order to suit to the

University's needs; IT experts have no involvement in the development of the system; the heads of the offices are the ones who signed the acceptance, not the end users (who are not comfortable with the output); software developer could not immediately fix the system bugs/errors due to location problem; HEI would go back to manual system due to the delay in the request for system maintenance; and IT personnel who administer the system are mostly designated and occupy temporary positions, hence teaching functions are of priority than the administrative function. These are just some of the problems evident in outsourcing of information systems.

On the other hand, HEIs with in-house developed systems revealed the following problems during interview: the implementation of the system is only good at the start, however it is difficult to maintain; in the case of smaller HEIs most of these in-house developed systems are not well-designed since it is mostly developed by one person and not a team and there is no existing legitimate office (e.g. MIS) authorized to manage the system, particularly those smaller Private HEIs; for SUCs whose IT faculty members are designated as system developers, their teaching functions would prevail as a priority over their administrative functions; the perseverance of the IT faculty has become an issue due to inappropriate compensation; and designated IT faculty cannot do maintenance activities on Saturdays and Sundays, hence fixing or troubleshooting is delayed; some administrators, particularly smaller private HEIs, are hesitant to fund for new IS projects and so they just adopt students' projects or theses for implementation; and some employees are resistant and do hardly cooperate in the implementation of the new system. These are just some of the problems experienced by HEIs with in-house developed systems.

Anchored on the above-mentioned problems and premise relative to IS acquisition in HEIs, this study has been conceptualized. Specifically, this study investigated the two methods of acquiring Information Systems – outsourcing and in-house development. It aimed to describe the management strategies and practices observed by HEIs in outsourcing and in-house development of the information systems currently used. It further sought to determine the performance of the outsourced and in-house developed information systems. Based from the findings of the study, a model for the acquisition of Information System for HEIs was developed. All public and private Higher Education Institutions (HEIs) with outsourced and in-house developed Information Systems in the Island of Samar were subjected to the investigation. A combination of quantitative and qualitative methods of research were employed in the study. The results of this study could assist administrators in the decision-making process for an effective Information System investment.

Statement of the Problem

This study aimed to determine the in-house development and outsourcing of the Information System (IS) of Higher Education Institutions (HEIs) in the Island of Samar.

Specifically, it sought answers to the following questions:

1. What is the profile of HEIs with respect to:

   1.1 current IS utilization;

   1.2 mode of IS project acquisition;

   1.3 IS implementation duration;

   1.4 allocated budget for IS;

   1.5 IS management structure; and

   1.6 operation?

2. What are the management strategies utilized by HEIs for in-house development and outsourcing of IS in terms of:

   2.1 planning;

   2.2 organizing;

   2.3 directing;

   2.4 controlling; and

   2.5 monitoring and evaluation (M&E)?

3. What are the practices in in-house development and outsourcing of IS of HEIs in terms of the following:

   3.1 requirements determination;

   3.2 implementation;

   3.3 documentation;

   3.4 assessment;

   3.5 cost management;

3.6 risk management?

4. What is the performance of in-house developed and outsourced IS of HEIs in terms of the following characteristics:

4.1 functionality;

4.2 reliability;

4.3 usability;

4.4 efficiency; and

4.5 sustainability?

5. Are there significant differences in the performance of in-house developed and outsourced IS of HEIs in terms of the following characteristics:

5.1 functionality;

5.2 reliability;

5.3 usability;

5.4 efficiency; and

5.5 sustainability?

6. What HEIs Information System Acquisition Decision Model should be developed based on the findings of the study?

Hypothesis

Based on the specific questions, the following hypothesis was advanced:

1. There are no significant differences in the performance of outsourced and in-house developed ISs of HEIs in terms of the following aspects:

1.1 functionality;

1.2 reliability;

1.3 usability;

1.4 efficiency; and

1.5 sustainability.

Theoretical Framework

The present study is anchored on Software Project Management (SPM) by Futrell, Shafer & Shafer (2001), as cited by Shaikh & Ahsan, (2015: 118). The SPM is a specialization of general management studies that utilizes the typical management skills of planning, organizing, staffing, leading or directing, and controlling to achieve defined project objectives.

In addition to the SPM, other theories and models that support the framework of the present study were considered. The principle of IT Governance is considered in the present study. IT Governance is defined as a decision-making process that involves investments in IT. Governance includes defining the decision-making process itself, as well as defining who makes the decisions, who is held accountable for results, and how the results of decisions are communicated, measured, and monitored (Reynolds, 2010: 118).

All these indicators of IT Governance were considered in the formulation of the management strategies and practices advanced in the present study. Figure 1 illustrates the key activities needed for effective IT governance.

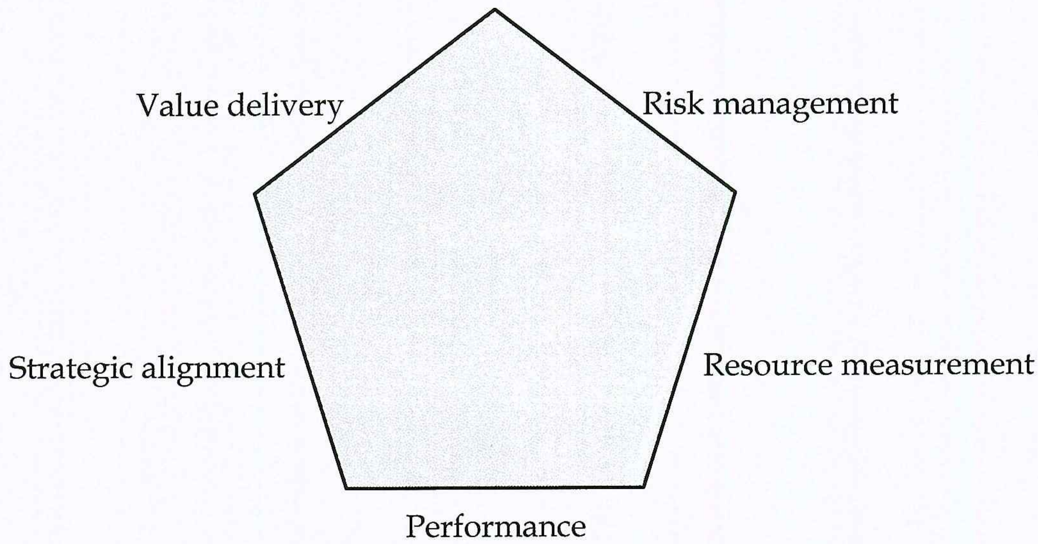


Figure 1. Five Key Activities Needed for Effective IT governance (Reynolds, 2010)

Krishnaveni and Meenakumari (2010: 284) introduced the Theoretical Model for Information Administration. The Model integrates the functional areas of information administration that are of great significance for day-to-day management of higher education institutions, namely: 1) Student administration, 2) Staff administration, and 3) General Administration. This Model is relevant since HEIs purposely acquire information systems and use them as tools in information administration. The Theoretical Model for Information Administration is depicted in Figure 2.

The "Make-or-Buy" decision for IS/IT investment likewise support the present study. Sena & Sena (2010: 1) articulated that the make-or-buy decision is a classic management issue. Sena & Sena cited that every firm uses thousands of inputs, and for each there is a potential to either manufacture the input or acquire it on the market. This "Make-or-Buy" decision suggests that the decision to make requires enormous assessment of resources prior to deciding on the choice IS acquisition, either outsourcing or in-house development.

Along the issue on whether to buy or build the system, McManus (2003) introduced his research model that showed the key considerations for making the decision to build or buy an integrated systems. These key considerations are shown in Figure 3.

The Transaction Cost Theory (TCT) developed by Williamson (1985) is a popular theory associated to outsourcing of information systems. This theory defines that transaction costs are related to the effort, time, and costs associated

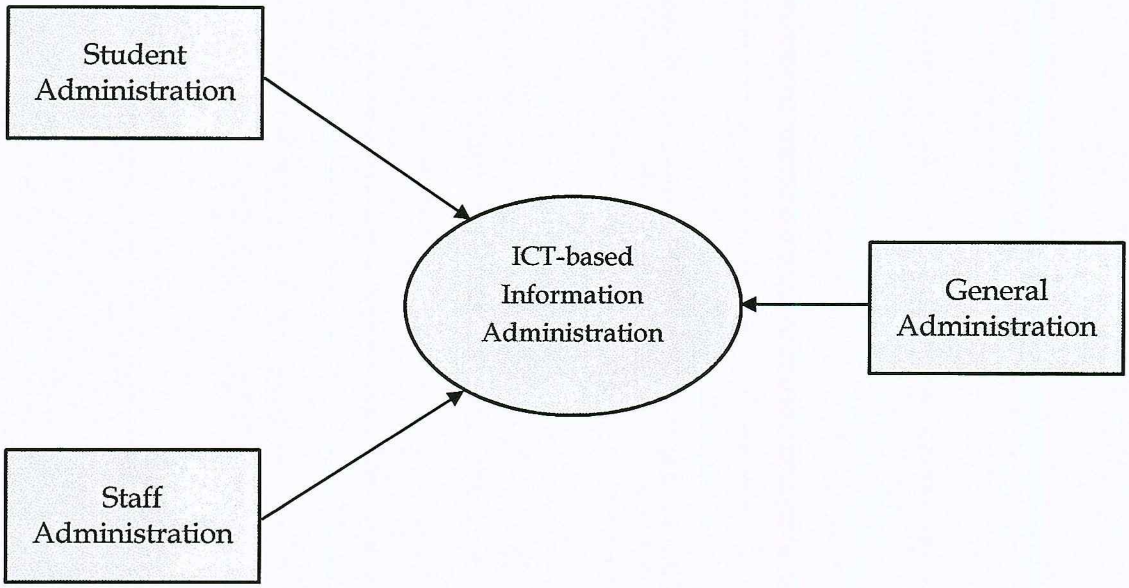


Figure 2. Theoretical Model for Information Administration (Krishnaveni & Meenakumari, 2010)

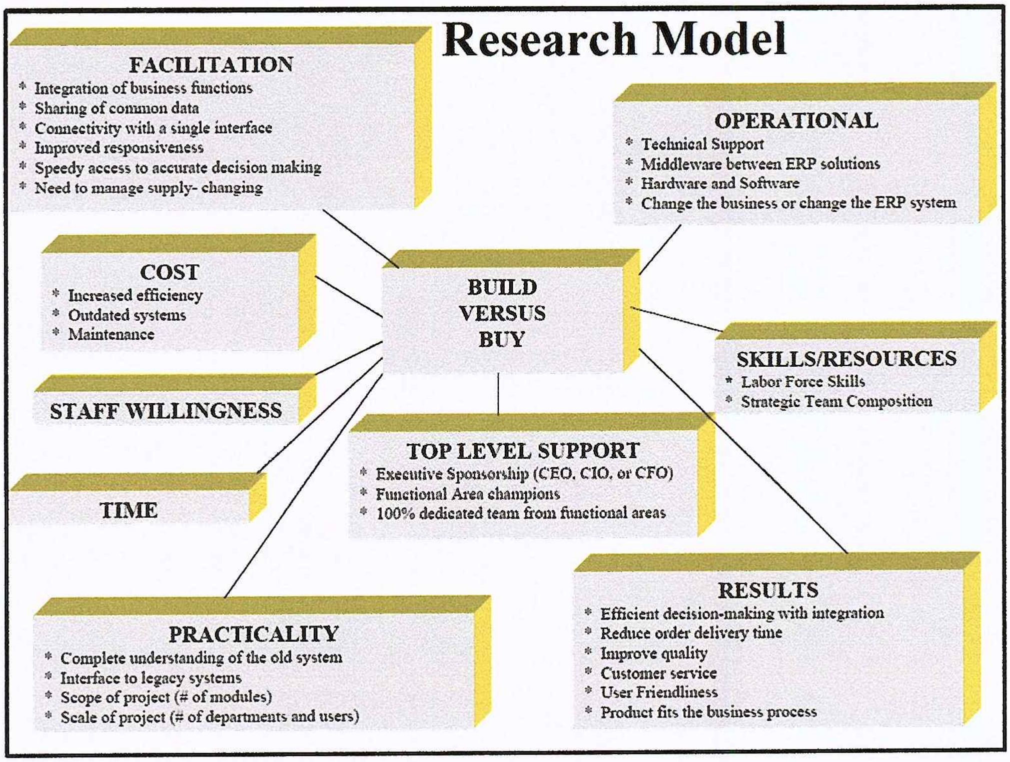


Figure 3. Detailed ERP System Decision Research Model (McManus, 2003)

with searching, creating, negotiating, monitoring, and enforcing a service contract between buyers and suppliers (Dhar & Balakrishnan, 2006: 41). Moreover, the TCT Model suggests that firms and individuals seek to economize on transaction cost, much as they do on production cost (Laudon & Laudon, 2012: p. 89). This theory implies that HEIs should consider the inclusion of all types of costs as these costs are equated to the overall cost of system development.

The Unified Framework for Outsourcing Governance developed by Meng, He, Yang and Ji (2007), as citedd by Garcia, Vicente, & Aragones (2013: 40) is another model relevant to ICT outsourcing. This model presents a unified framework on the governance of outsourcing from the combined perspectives of the customer and the provider. The framework focuses on three areas: governance processes; organizational structure of governance; and performance measurement. The present study adopted these three areas in deciding for information systems acquisition, either in-house development or outsourcing.

Another most used theory in IS research is the Technology Acceptance Model (TAM) originally proposed by Davis in 1986. TAM is one of the most influential research models in studies of the determinants of information systems and information technology acceptance to predict intention to use and acceptance of information systems and information technology by individuals (Oliviera & Martins, 2011: 110). In TAM, there are two determinants: perceived ease of use and perceived usefulness. The perceived ease of use is the degree to which a person believes that using a particular information system or information technology would be free of effort. On the other hand, the perceived usefulness is the degree to which an individual believes that using a particular information system or information technology would enhance his or her job or life performance. (Chen, Li & Li, 2011: 124-125). The original TAM is shown in Figure 4.

The TAM applies to both outsourcing and in-house development acquisition methods because the utilization of an information system in the administrative and academic operations should be useful in performing the tasks and deliver efficient and effective results, regardless that system is outsourced or in-house developed.

The ISO 9126 model is considered in the present study as anchorage in the evaluation of the in-house developed and outsourced information systems. The ISO 9126 was originally developed in 1991 to provide a framework for evaluating software quality (Titthasiri, 2014: 590). The Model uses six characteristics to evaluate the quality of software, namely functionality, reliability, usability, efficiency, maintainability, and portability. Figure 5 depicts the software quality characteristics and metrics of the ISO/IEC 9026 Model (Djouab & Bari, 2016).

For in-house development, the Systems Development Life Cycle (SDLC) Model is widely used. The SDLC is a common methodology for systems development in many organizations; it features several phases that mark the progress of systems analysis and design effort (Hoffer, George, & Valacich, 2011: 35-40). The phases and activities within each phase of SDLC have provided the

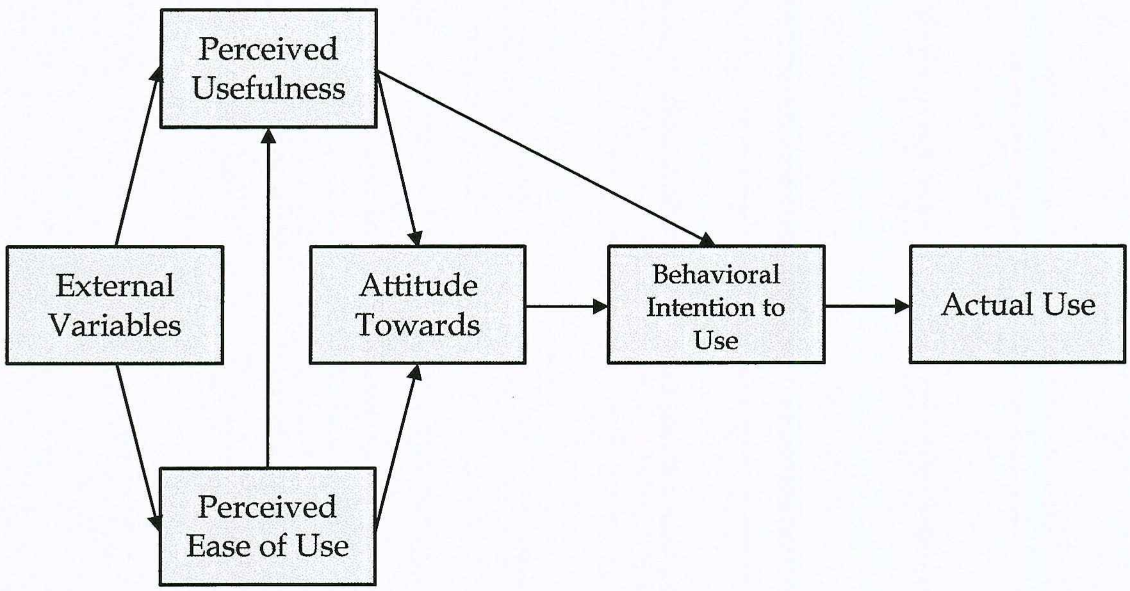


Figure 4. The original Technology Acceptance Model (Davis, 1989)

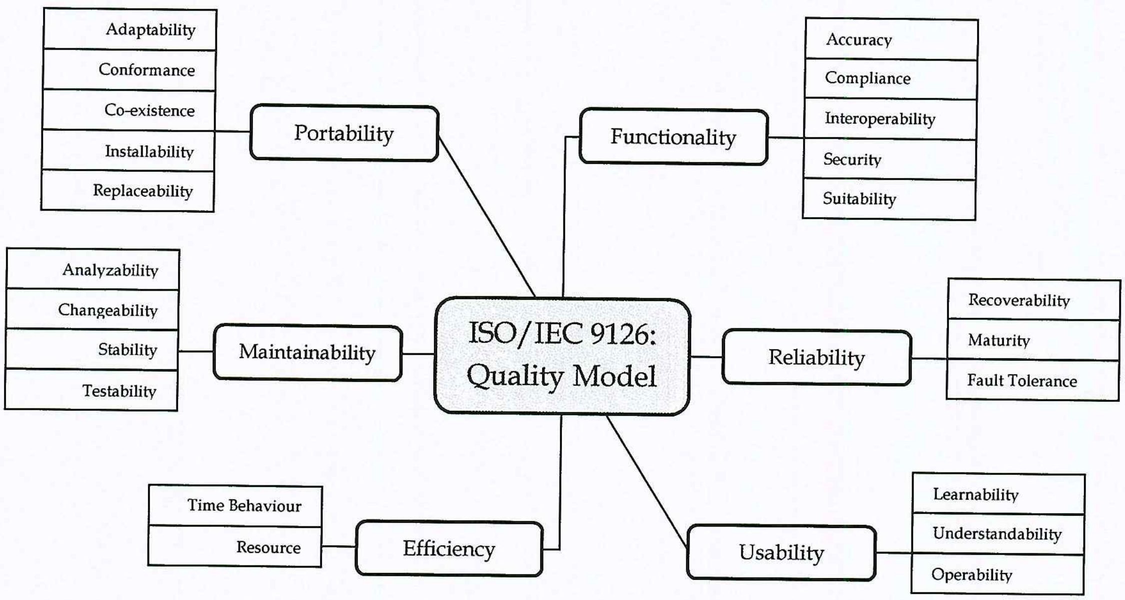


Figure 5. ISO/IEC 9126 Quality Model – External and Internal Quality (Djouab & Bari, 2016)

framework in the formulation of management strategies and practices for HEIs with in-house developed systems and outsourcing. The stages of SDLC Model is shown in Figure 6.

For the model development, this part of the study is anchored on Process Modeling. This model consists of the basic steps used for model building: 1) model selection; 2) model fitting; and 3) model validation. These three basic steps are used iteratively until an appropriate model for the data has been developed. (Engineering Statistics Handbook, 2013). This Process Modeling offers significant inputs to HEIs in determining the appropriate information system acquisition method. The sequence of building the model is described in Figure 7.

These above theories have brought impact in the pursuit of this research and have provided direction to the present investigation.

Conceptual Framework

The Conceptual Framework has been formulated in order to show the outline of research process and approach in the conduct of this study and meet its objectives. The constructs in the conceptual framework were defined from the objectives of the study and the literature review mentioned. The conceptual framework is illustrated in Figure 8.

As shown in the context diagram, HEIs with outsourced and in-house developed information systems serve as reference of the desired information to achieve the expected outcome of the study. Initially, the profile of HEIs is

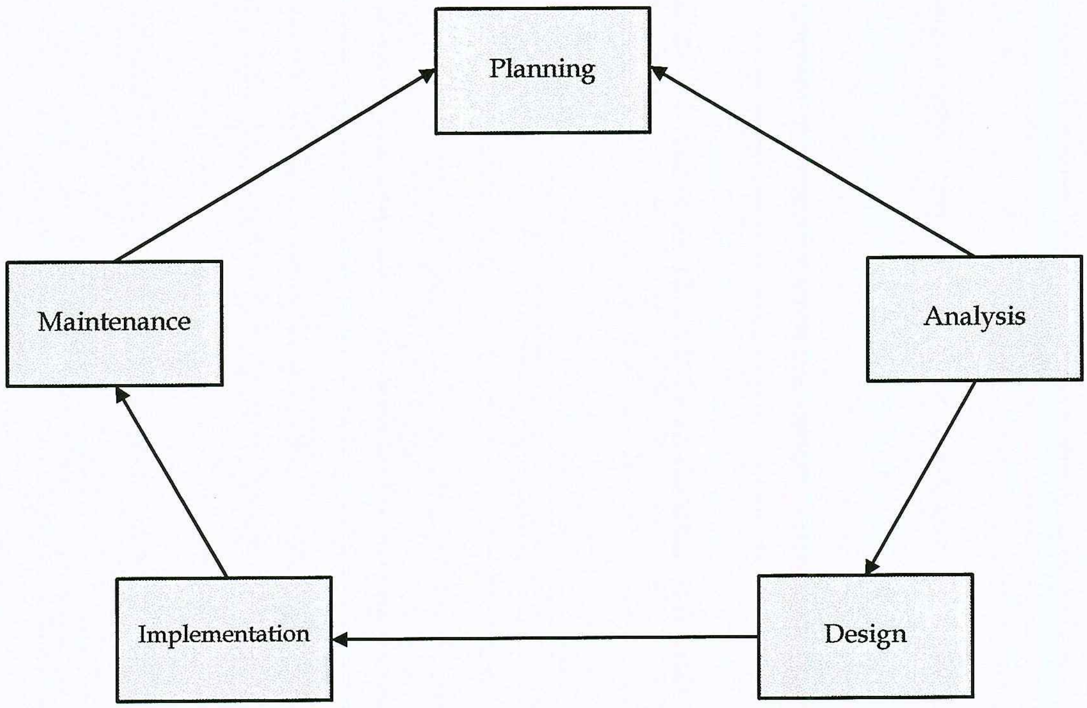


Figure 6. The Systems Development Life Cycle (Hoffer, et al., 2009)

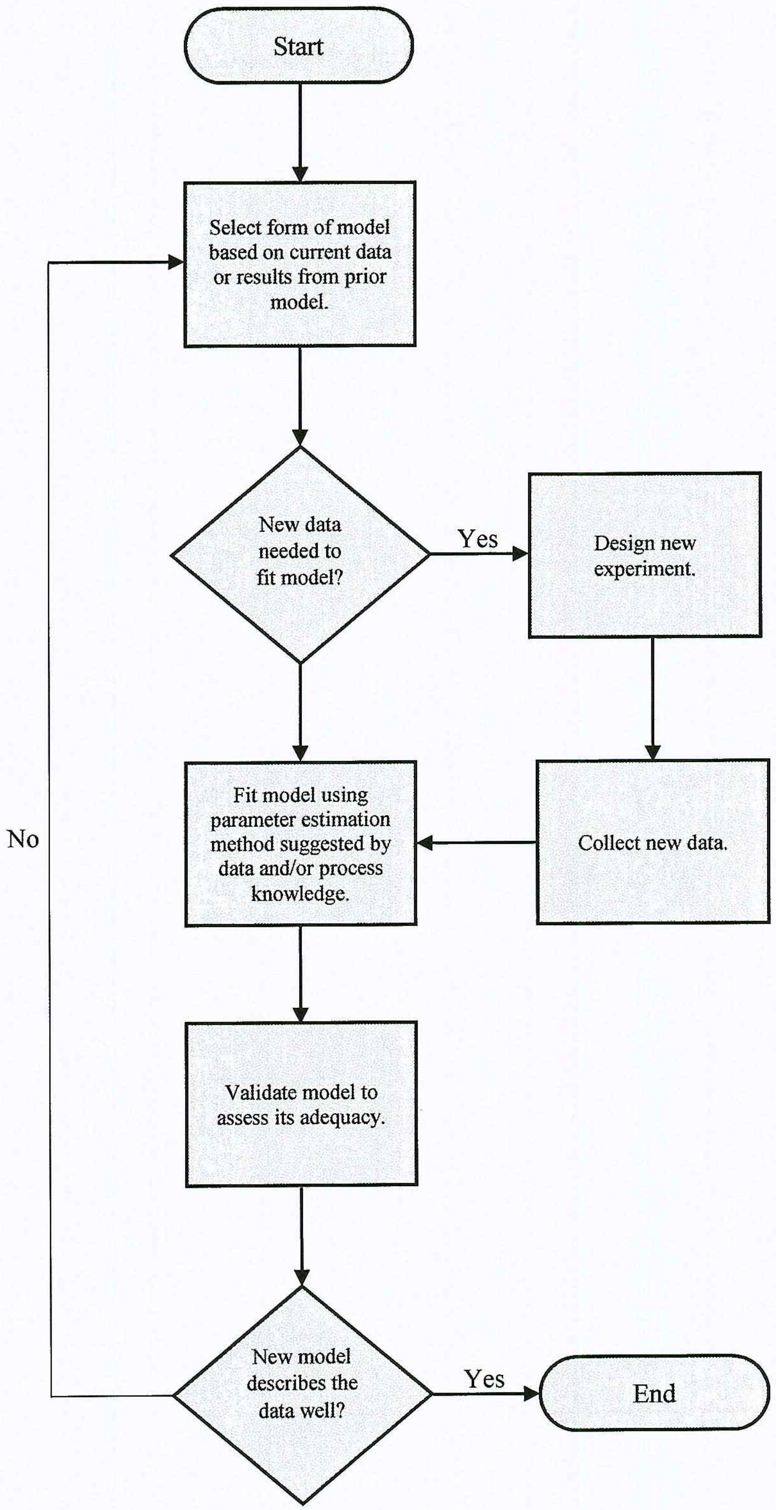


Figure 7. Model Building Sequence (Engineering Statistics Handbook, 2013)

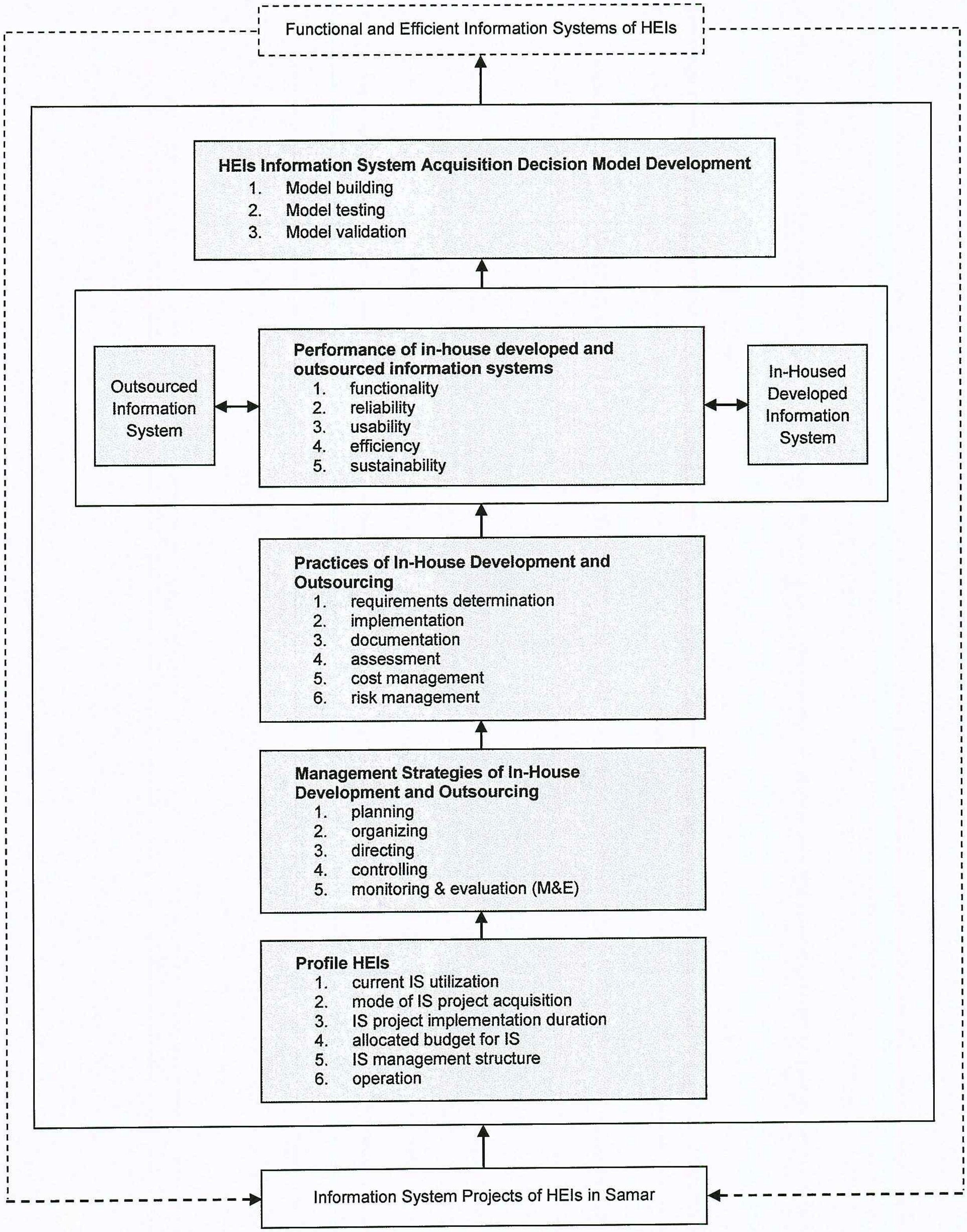


Figure 8. The Conceptual Framework of the Study

determined with respect to the following: 1) current IS utilization, 2) mode of IS acquisition, 3) IS implementation duration, 4) allocated budget for IS, 5) IS management structure; and operation.

After the profile has been determined, the management strategies in outsourcing and in-house development of IS are assessed using the following variables: 1) planning, 2) organizing, 3) directing, 4) controlling, and 5) monitoring and evaluation (M&E).

In addition to management strategies, the practices in outsourcing and in-house development of information systems are assessed based on the following aspects: 1) requirements determination, 2) implementation, 3) documentation, 4) assessment, 5) cost management, and 6) risk management.

The study further investigated the performance of the information system as products of outsourcing and in-house development acquisition methods, respectively. The performance was determined using the following criteria: 1) functionality, 2) reliability, 3) usability, 4) efficiency, and 5) sustainability. The results of investigation could provide information as to which of the two modes of acquisition generates a better software/system product.

Based from the results of assessment and evaluation, an Information Systems Acquisition Decision Model was developed. The development of the model followed the following stages: 1) model building; 2) model fitting; and 3) model validation. The results of the model development would provide insight in selecting the appropriate method of information system acquisition based from the analyzed data.

The expected outcome of the study is a functional and efficient Information System project for HEIs. Hence, HEIs will be able to acquire and implement useful and reasonable Information Systems based from the findings of this study.

Significance of the Study

Primarily, the researcher believes that this study would be beneficial to the following:

Administrators. The findings of the study would serve as inputs in the decision-making process for IS acquisition. Through the results of this study, the administrators would be aware of the type IS acquisition method that fits to their school operations.

IT Personnel. The results of the study would help IT personnel of HEIs for a more effective planning activity on IS implementation.

Students. The students, being the primary clientele of HEIs, would be assured of a functional information system. The results of the study could be the bases in acquiring information system that would suit to the needs of the students and serve them in an effective and efficient means.

Faculty & staff. Similarly, the faculty and staff would be assured of a functional information system. As end-users, faculty and staff would be able to perform their duties and functions effectively and efficiently with the help of a desired and functional information system.

Researchers. The findings will provide important inputs for researchers studying outsourcing and in-house development of Information Systems. It will provide a better understanding of what would be anticipated when similar research is conducted.

Services Providers. The results of the study will provide important information that will serve as bases of IS Services Providers and Software Developers in dealing with the IS projects particularly on service agreements and improvement of services and quality software product.

Scope and Delimitation

This study focused on the management strategies and practices in outsourcing and in-house development of Information Systems. In addition, the existing outsourced and in-house developed systems were evaluated to determine their performance. The systems that were considered in the study were those that are used in the day-to-day operations of HEIs.

The study was conducted to SUC HEIs and Private HEIs in the island of Samar. Figure 9 is the map of the Island of Samar showing the locations of HEIs identified in the study. These HEIs include Samar State University – Main Campus, Eastern Samar State University – Main Campus, University of Eastern Philippines – Main Campus, University of Eastern Philippines – Catubig Campus,

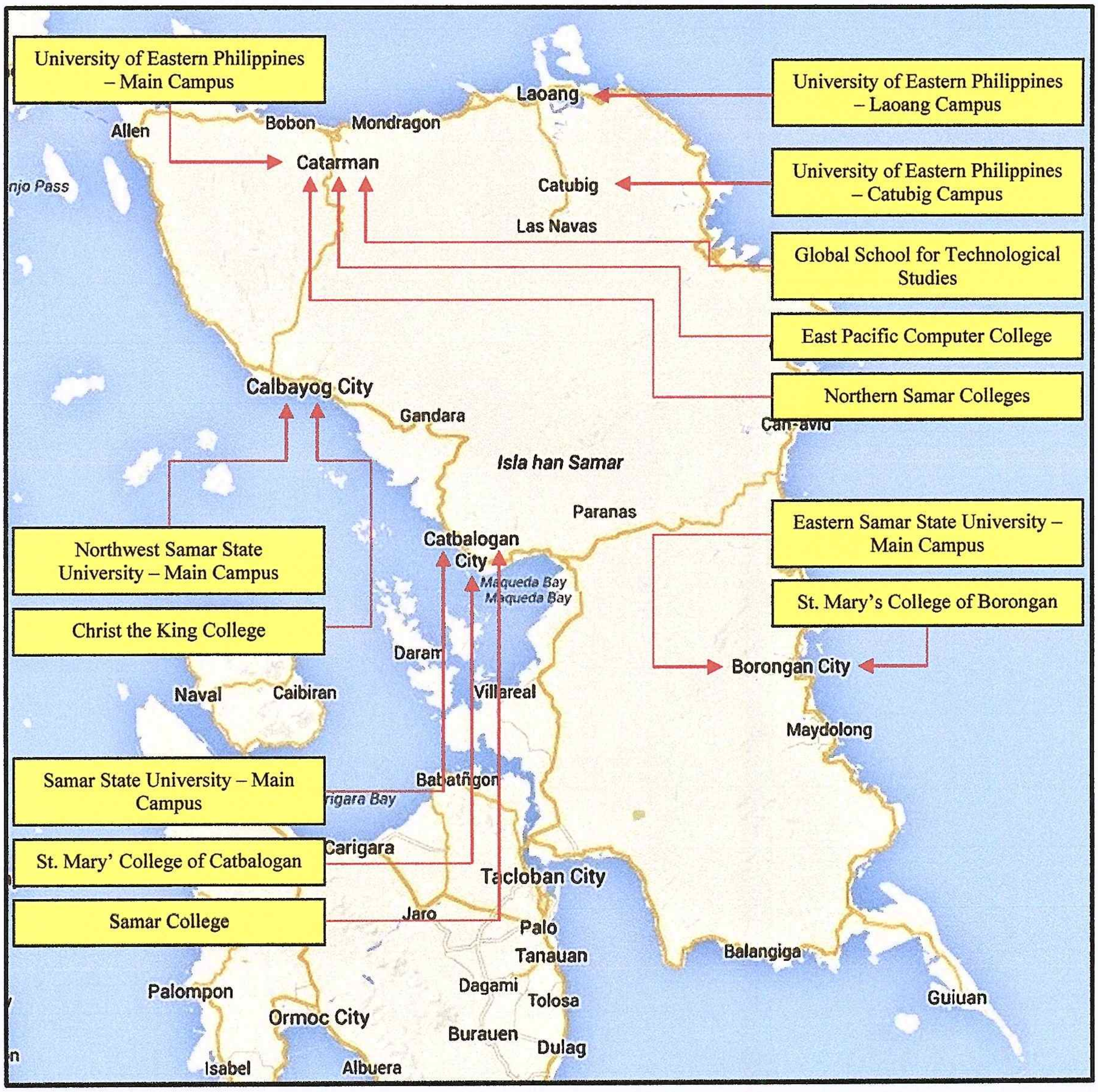


Figure 9. Map of the Island of Samar Showing the Research Environment

University of Eastern Philippines – Laoang Campus, St. Mary's College of Catbalogan, Samar College, Christ the King College, St. Mary's College of Borongan, Northern Samar Colleges, Global School for Technological Studies, and East Pacific Computer College.

The respondents of the study were those who have direct participation in the management and utilization of the system. These included the Head and Staff of MIS or IT Services Office, assigned IT personnel for HEIs with no established Office that manage the system, users of the system who are normally staff of offices served by the system such as the Registrar, Accounting, Cashier, and Library, and others who are involved in the decision-making relative to acquisition of the system.

The study was conducted during the school year 2015-2016.

Definition of Terms

The following terms were defined operationally and technically to facilitate better understanding of this study.

Allocated budget for IS. As used in the study, this refers to the amount of funding designated to a specific Information System (IS) implementation by an HEI. It is one of the profile variables treated in the study.

Assessment. In this study, assessment refers to the method and specific activities used to evaluate and measure the status of the information systems presently used by HEIs. It is one of the variables of practices being considered in this study since it determines the present condition of the system and the recommendations which can be made based from its status.

Controlling. This refers to the process of measuring performance and taking action to ensure desired results (Schermerhorn, 2008: 18). It monitors progress & implements necessary changes (Bateman & Snell, 2005: 16). Controlling is one of the management strategies being investigated in this study. It includes the comparison of the agreed activities, processes, resources, cost, specifications, etc. with the actual results of system development, both for outsourcing and in-house development.

Cost management. It includes the processes required to ensure that a project team completes a project within an approved budget (Scwalbe: 2007, 251). Cost management is used to describe the set of activities in planning and controlling, which incorporates the continuous reduction of costs (Correia dos Santos & Mira da Silva, 2012: 4). Cost management is one of the variables of practices being considered in this study that determines how HEIs plan for their expenditures and conduct cost accounting and monitoring on system implementation which may include operational cost such as labor, equipment, and materials, etc.

Current IS utilization. Current IS utilization is one of the profile variables in this study. It refers to the areas where information systems are used to support effective and efficient academic and administrative activities of HEIs. This may include areas such as student enrollment and records management, finance and accounting management, personnel records management, library services, payroll process, and others.

Directing. Directing is one of the management strategies being investigated in the study. It refers to instructing, guiding, and supervising the development of the information system. It includes the assigning of tasks and activities to specific person as well as communicating any relevant information.

Documentation. Documentation refers to the descriptions of how an information system works from either a technical or end-user standpoint (Laudon & Laudon, 2012: 501). Documentation is one of the variables under practices. It may include the recording of activities and processes particularly on the completion and changes during system implementation. It also includes documentation that describes the system and how it is used.

Efficiency. It refers to the capability of a system to provide performance relative to the amount of the used resources, under stated conditions (Alrawashdeh, et al., 2013: 5; Fahmy, et al., 2012: 119). Efficiency is one of the criteria used to measure the performance of the outsourced and in-house developed system. It specifically measures the processing and completion time of a particular task delivered by the system.

Functionality. It refers to the capability of the software to provide functions which meet the stated and implied needs of users under specified conditions of usage (Alrawashdeh, et al., (2013: 5).; Fahmy, et al., (2012: 118)). In this study, functionality is one of the criteria used to measure the performance of the outsourced and in-house developed systems. It covers the areas of access, data entry & create records, search & retrieve records, records processing, edit & update records, delete records, report generation, interoperability, error prevention and control, and security.

Higher Education Institutions (HEIs). According to UNESCO, HEI is an establishment recognized by the relevant authorities of a party that provides higher education qualifications (CHED Memorandum Order No. 46, series 2012: 4). In this study, HEI includes post-secondary academic institutions in Samar offering higher education program/s. HEIs are categorized as SUC HEIs, Private HEIs, and Local College.

HEIs Information System Acquisition Decision Model. This refers to the Model that is developed as an output of the study. The Model is designed based from the findings of the study. It predicts the appropriate method in acquiring information systems – whether in-house development or outsourcing.

Implementation. It refers to the process that carries out the plans for changes in business/IT strategies and applications that were developed in the planning process (O'Brien & Marakas, 2011: 464). In this study, implementation refers to the practices of setting up the information system in an HEI. Specifically, it includes related activities such as the acquisition of hardware and software or development, user preparation, training of personnel, site preparation, installation, testing, and start-up activities of the system.

IS implementation duration. IS implementation duration is one of the profile variables used in this study. It refers to the period of the utilization and operation of the system, starting from its development stage up to the present This will provide idea about the maturity of the system.

IS management structure. IS management structure is one of the profile variables used in this study. It refers to the organization of the acquired information system. It suggests the coordination of the tasks among the people who facilitate the implementation of the system within the HEI. Specifically, the IS management structure considers the office that manages the system, the organizational structure, and the personnel involved in the operation of the system.

In-house development. It refers to the process whereby the company uses its own workers (in-house team) to develop or implement an IT system that fits the specific needs of the company (Setende, 2012). In this study, in-house development means utilizing HEI's own IT personnel and other resources to develop and implement the information system.

In-house developed Information System. In-house developed information system refers to IS projects implemented by HEIs through in-house development method. This in-house developed information system has been subjected to performance evaluation in the study.

Information System. Information System refers to a set of interrelated elements or components that collect (input), manipulate (process), store, and disseminate (output) data and information to provide a reaction (feedback) to meet an objective (Reynolds & Stair, 2009: 8). Technically, it is a set of interrelated components that collect (or retrieve), process, store, and distribute information to support decision making and control in an organization (Laudon & Laudon, 2012: 15). As used in the study, information system refers to the computerized system or application used by HEIs as tools in support to performing administrative and academic operations. It could be outsourced or in-house developed. It is subjected to investigation in terms of management strategies, practices and performance.

Management Strategies. In the present study, management strategies refer to the specific approaches utilized by the HEIs in managing information system outsourcing and in-house development activities. These management strategies were basically anchored from Software Project Management (SPM) by Futrell, et al. (2001). The management strategies considered in the study are planning, organizing, directing, controlling, and monitoring and evaluation (M&E).

Mode of IS acquisition. As used in the study, this refers to the method of acquisition for the IS project development of HEIs. These two modes are outsourcing and in-house development. These modes are the bases in the development of the output of the study, the HEIs Information Systems Acquisition Decision Model.

Model building. It refers to constructing the basic framework of the model It reflects the belief about how the system operates which is stated in the form of underlying assumptions (Marion, 2008: 4). In the present study, model building refers to the first stage of the model development where the proposition is established in a form of a mathematical equation.

Model fitting. A stage in model development used to estimate the unknown parameters in the Model (Engineering Statistics Handbook, 2013). In the present study, model fitting is the stage in model development where the training dataset are fitted on to the model using Regression Analysis.

Model validation. It refers to testing of the model against observation from physical system which it represents (Marion, 2008: 18). This stage of model building carefully assess the model to see if the underlying assumptions of the analysis appear plausible (Engineering Statistics Handbook, 2013). In the present study, model validation refers to the use of the model using test dataset.

Monitoring and evaluation (M&E). Monitoring looks at what is being done and how it is being done, while evaluation looks at performance against goals (Wagner, et al., 2005: 33). Monitoring and evaluation is one of the management strategies being investigated in the study. It specifically focuses on validation and review of tasks, activities, costs, and agreements during the entire period of outsourcing or in-house development of the system.

Operation. It refers to a work done in organizations to sustain the business (Schwalbe, 2007: 4). Operation is one of the profile variables used in this study. It involves all the activities and processes of operating or functioning the information systems of HEI. It includes areas such as on-going technical support, monitoring and evaluation, assessment, training and re-training, documentation, and debugging and testing of the acquired system.

<u>**Organizing.**</u> It refers to the process of assigning tasks, allocating resources, and coordinating activities (Schermerhorn, Jr., 2008: 17); It is the assembling and coordinating the human, financial, physical, informational, and other resources needed to achieve goals (Bateman & Snell, 2005: 16). Organizing is one of the management strategies being asked in the study. It is referred to as structuring the resources and activities in the acquisition or development of HEI's information system.

<u>**Outsourced Information System.**</u> This refers to IS projects implemented by HEIs through outsourcing approach. This outsourced information system has been subjected to performance evaluation in the study.

<u>**Outsourcing.**</u> It is the delegation of specific work to a third party for a specified length of time, at a specified cost, and at a specified level of service (Haag & Cummings, 2009: 276); It means hiring of external vendor, developer, or service provider to create or supply the system (Dennis, et al., 2012: 267). In this study, outsourcing means acquiring of IS products/services by an HEI from an external IS services provider.

<u>**Planning.**</u> It refers to the process of setting objectives and determining what should be done to accomplish them (Schermerhorn, Jr., 2008: 17). It is the specifying of the goals to be achieved and deciding in advance the appropriate actions needed to achieve those goals (Bateman & Snell, 2005: 16). In the present

study, planning is the first aspect of management strategies being treated. It considers the investigation of all the activities prior to the acquisition of the information system, whether outsourcing or in-house development.

Practices. As used in the study, practices refer to the actual activities and techniques employed by HEIs in the in-house development and outsourcing of an information system. It includes requirements determination, implementation, documentation, assessment, cost management, and risk management practices.

Performance. Performance addresses how well a product or service performs the customer's intended use (Schwalbe, 2007: 295-296). In this study, performance is a variable that measures the capability of the outsourced and in-house developed information systems of HEIs using the following criteria: functionality, reliability, usability, efficiency, and sustainability.

Reliability. It refers to the capability of the software to maintain its level of performance under stated conditions for a stated period of time (Alrawashdeh, et al., 2013: 5); it is the ability of a product or service to perform as expected under normal conditions (Schwalbe, 2007: 296). As used in this study, reliability is one of the criteria used to measure the performance of the outsourced and in-house developed systems of HEIs. It measures the minimization of error, fault tolerance, back-up and recovery, and scalability of the system.

Requirements determination. Requirements determination refers to transforming the system request's high-level statement of business requirements into a more detailed, precise list of what the new system must do to provide the needed value to the business (Dennis, et al., 2012: 104). Requirements determination is one of the practices assessed as to how HEIs would determine the expected functionalities of the system to be developed. It uses several methods such as interview, document analysis, and on-site visit.

Risk management. Risk management refers to the process of assessing and addressing the risks that are associated with developing a project (Dennis, et al., 2012: 78). Risk management is one of the practices assessed to determine how HEIs mitigate risk in outsourcing and in-house development of the system. It includes evaluation of the service provider's integrity and capability, evaluation of additional component of the system, reviewing the terms and conditions in the contract, provision of security mechanisms, and others.

Service Provider. In this study, the service providers are companies contracted by HEIs to develop the software product and perform related services the same.

Sustainability. Sustainability is one of the variables used in this study to measure the performance of the system. It refers to the ability of the outsourced or in-house developed information system maintain the operation during its life time. It considers the areas of maintainability and enhancement, adaptability, and documentation.

Systems Development Life Cycle (SDLC). Systems Development Life Cycle (SDLC) refers to a framework for describing the phases involved in developing information system (Schwalbe, 2007: 57). It represents a series of well-defined phases performed in sequence that serve as framework for developing a system or project (Hossein, 2012). As used in the study, SDLC has been used as basis in the formulation of the management strategies and practices in system development.

Usability. Usability refers to the capability of the software to be understood learned, used, and attractive to the users, when used under specified conditions (Alrawashdeh, et al., 2013, 5; Fahmy, et al., 2012: 118). Usability is one of the criteria used in this study to measure the performance of the outsourced and in-house developed system. It covers the areas of navigation, interface, ease of use, and help mechanism.

Chapter 2

REVIEW OF RELATED LITERATURE AND STUDIES

This chapter reviews various related literature and studies which are useful to the present study. The reviewed literature and studies provide relevant information and serve as guide in the formulation of the present study particularly on the problem statement and variables used. The literature and studies cited in this section summarize the different perspectives in terms of outsourcing and in-house development of Information Systems of Higher Education Institutions.

Related Literature

Rapid growth in the field of education has made governance in academic sector a very complex task (Krishnaveni & Meenakumari, 2010: 282). With this complexity, higher education institutions (HEIs) had to invest in Information Systems in order to achieve efficiency and improvement of internal administration. Zornada & Velkavrh (2015) exemplified adoption of information systems into HEIs' internal administration by stating that the ERP systems for higher education were developed to provide support for key administrative and academic services. Zornada & Velkavrh specifically cited that the most important part of a system is primarily to support a minimal student administration (enrolment procedures and student enrolment, financial support for students, student data), human resource management (monitoring of employees) and finance (accounting, payments, investments, budget). Furthermore, these systems could include other programme add-ons such as assets management (contracts, subsidies, grants, etc.) or for monitoring student and developmental services of institutions.

On university management, Sagitova (2012: 56) mentioned the significance of information systems in higher education. The author stated that systems serve to control the entire educational processes. These processes include the activities of deans' offices and departments, compilation of time-tables, introduction of changes into the list of staff the university members, etc. This indicates that information systems have various applications within the HEI.

Information Systems indeed provide enormous amount of advantages in performing both academic and administrative activities of HEI. However, the acquisition of these Information Systems is one major decision to make. According to McManus (2003), the real issue for organizations to address is what methodology is best for their organization. The statement of McManus implies that HEIs have to carefully decide and make a strategic option whether to implement outsource or in-house potential IS projects. This premise is affirmed by Brcar & Bukovec (2013: 13) by citing that arguments whether to select outsourcing or in-house are of great importance in decision-making.

For a better understanding about outsourcing and in-house development of information systems, various literature that describe these two acquisition methods were cited.

According to Belcourt (2006: 270), outsourcing occurs when an organization contract with another organization to provide services or products of a major function or activity. It is a contractual relationship for the provision of business services by an external provider. Outsourcing differs from alliances or partnerships or joint ventures in a way that the flow of resources is one-way, from the provider to the user. It is based on a long-term, regular partnership, where the provider is responsible for the complete results in the outsourced activity (Milecova, et al., 2010: 388).

Specifically, IS outsourcing refers to a situation in which part or all of the IS activities of an organization are performed by external service providers. This includes IS tasks relating to applications development and maintenance, systems operation, networks/telecommunications management, end-user computing support, systems planning and management, and purchase of application software, but excludes business consulting services, after-sale vendor services, and the lease of telephone lines (Kim, et al., 2003: 529). On these tasks performed during outsourcing, the present study primarily consider application development and maintenance since these are the outsourcing services usually contracted by HEIs in Samar to support their internal administration.

Moreover, customers partner with the company to manage and operate their applications and IT systems, generally under a mutually beneficial agreement. The company provides service level assurances to ensure quality of service is attained and measured (Yarlikas, 2010: 73). The premise on the provision of quality of service by the service providers makes contract management a very significant issue. Contracts are an important part of the analysis of outsourcing decisions for they can provide effective mechanisms for managing the outsourcing relationship and early termination provisions in cases of under performance (Osei-Bryson & Ngwenyaman, 2005, 245). Moreover, managing the outsourcing well is critical. It needs to address several issues such as: it must be subjected to a cost–benefit analysis; could contractor do better job and faster, while maintaining service levels and meeting legislative requirements; and how outsourcing would be measured (Belcourt, 2006: 275). In the present study, the company that operate the applications and IT systems for customers the software developers or service providers which provide the IT services to HEIs.

On the other hand, in-house development is the process whereby the company uses its own workers (in-house team) to develop or implement an IT system that fits the specific needs of the company. This process allows for the creation of a more customized system that can have an exact fit in the company. The direct contact between the software team and the people that would be using the system allows the system to be tailored in a way that it could incorporate some or most of the wishes of the users. This approach requires a group of or team of programmers, business analysts etc. that work closely together and are reporting in a common reporting line which makes the coordination easier. The individuals in the team are expected to be experienced in developing and implementing IT system, have a thorough understanding of the company's business processes, and able to maintain as well as improve the system and adapt it to changing business requirements (Setende: 2012). In addition, in-house developed solutions offer a great potential for interacting with the users during the development process. Because the developers are an integral part of the organization, developing a solution "in-house" presents a great opportunity for participation. In-house developed solutions thus have a high potential to meet business needs by applying participatory development processes that support gathering and specification of user requirements and inhouse usability testing (Owoseni & Imhanyehor, 2011: 7).

The present study investigates the management activities of information system outsourcing and in-house development. Laudon & Laudon (2012: 529) articulated that the development of a new system must be carefully managed and orchestrated because it is likely to be the most important factor influencing its outcome when the system is executed. Furthermore, without proper management will most likely suffer the following consequences: costs that vastly exceed budgets; unexpected time slippage; technical performance that is less than expected; and failure to obtain anticipated benefits. The statements of Laudon & Laudon implies that it is essential to have some knowledge about information systems management, whether outsource or in-house development, in order to ensure that the delivery of genuine business benefits to the entire stakeholders of HEIs.

Schermerhorn (2008: 17) identified the process of management which includes planning, organizing, leading, and controlling the use of resources to accomplish performance goals. On the other hand, O'Brien and Marakas (2011: 507-508) identified the five phases in the process of modern project management approach as: 1) initiating and defining, 2) planning, 3) executing, 4) controlling, and 5) closing.

The management strategies identified in the present study is anchored on the above-mentioned literature on project management phases. However, the present study considered the planning, organizing, directing, controlling and monitoring and evaluation (M&E) strategies since these are deemed more appropriate and applicable to managing Information System projects in HEIs.

Inadequate project planning could cause delay in project implementation and would result to inappropriate systems with outdated design and obsolete technology (Nawi, et al., 2012: 74). According to Haag & Cummings (2009: 278), planning for systems development involves the following activities: 1) define the system to be developed, 2) set the project scope; and 3) develop the project plan including tasks, resources, and timeframes. Hoffer, George & Valacich (2011: 35-40) similarly enumerated the three activities in Information Systems Planning (ISP), to wit: 1) assess the current IS-related assets such as human resources, data, processes, and technologies; 2) develop target blueprints of these resources; these blueprints reflect the desired future state of resources needed by the organization to reach its objectives as defined during strategic planning; and 3) define a series of scheduled projects to help move the organization from its current to its future desired state.

Organizing is described as management function of arranging and structuring work to accomplish the organization's goals (Robbins & Coutler, 2007, 294). It involves the process of assigning tasks, allocating resources, and coordinating the activities of individuals and groups to implement plans (Schermerhorn, 2008: 17).

Directing is the implementing and carrying out the approved plans. It involves steps as: 1) Staffing – seeing that a qualified person is selected for each position; 2) Training – teaching individuals and groups how to fulfill their duties and responsibilities; 3) Supervising – giving others day-to-day instruction, guidance, and discipline as required so that they can fulfill their duties and responsibilities; 4) Delegating – assigning work, responsibility, and authority so others can make maximum utilization of their abilities; 5) Motivating – encouraging others to perform by fulfilling or appealing to their needs; 6) Counseling – holding private discussions with another about how he might do better work, solve a personal problem, or realize his ambitions; and 7) Coordinating – seeing that activities are carried out in relation to their importance and with a minimum of conflict (Kerzner, 2009: 193).

Controlling would measure work performance, compare results to objectives, and take corrective action as needed. In controlling, an active contact with people in the course of work is maintained, reports on performance are gathered and interpreted, and a constructive action and change are planned using the gathered information (Schermerhorn, 2008: 19). Moreover, controlling is a three-step process of measuring progress toward an objective, evaluating what remains to be done, and taking the necessary corrective action to achieve or exceed the objectives (Kerzner, 2009: 193).

Systems of Monitoring and Evaluation (M&E) exist to assess what works and what does not work, and to what extent it works or not (Hua & Herstein, 2003: 14). The purpose of M&E is to provide credible options based on the best information that can be gathered to support one or another decision (Wagner,et al., 2005: 22). Specifically, monitoring could involve continuous tracking of activities, review of the flow of services and activities provided by the program, compliance with laws, regulations, guidelines, etc. while, evaluation looks at performance against goals. On the other hand, Evaluation looks at performance against goals. This can and should take place while the program or research project is underway, and is concerned with evaluating how the intervention is meeting its performance goals (Wagner, et al., 2005: 33-34). At the most detailed level, monitoring will involve the following activities: 1) completion of weekly timesheets; 2) review of completed activities; 3) identifying milestones reached; and identifying any problems or issues (The ITS Project Management Group, 2014).

All the above literature on management functions are associated to the present study as foundations in determining the management strategies performed by HEIs in Samar in the acquisition and management of information system, either outsourced or in-house developed. The planning variable would examine how HEIs in Samar prepare some activities prior to the IS acquisition; organizing would investigate the specific activities relative to allocation and coordination of the needed IS resources; directing would explore how are people involved in information system acquisition and development are instructed, guided, and supervised; controlling would examine what activities are performed to ensure that they are in accordance with the planned information system; and monitoring and evaluation would assess the activities performed by HEIs in relation to gathering information that would help improve the administrators' decision-making relative to information system implementation in their schools.

In addition to management strategies, the practices that are relevant to the outsourcing and in-house development of information systems by HEIs in Samar are treated in the present study. The first of the practices treated in the present study is requirements determination. Requirements determination is performed to transform the system request's high-level statement of business requirements into a more detailed, precise list of what the new system must do to provide the needed value to the business (Dennis, Wixom & Roth, 2012). During requirements determination, information on what the system should do are gathered from as many sources as possible. Some of the techniques used in requirements determination include interviewing, observing users in their work environment, and collecting procedures and other written documents (Hoffer, George, & Valacich, 2011: 191). When described independently in terms of requirements determination, the requirements are defined, analyzed, programmed, maintained and developed using the firm's own resources in an in-house development method; the in-house developers themselves define the requirements, build the software and maintain it. In the case of the totally off-the-shelf commercial offering, requirements are already with the package as it comes out of the box. (Clydebuilt Business Solutions Ltd., 2012).

The preceding premise on the process of requirements determination for the system to be acquired are the ones that the present study would look into. This means HEIs will be assessed how they perform requirements determination based from the practices mentioned in the literature.

Basically, the new system is implemented after requirements determination or design stage of system development. The implementation of the new system is made up of many activities, and this includes hardware acquisition, software acquisition or development, user preparation, hiring and training of personnel, site and data preparation, installation, testing, start-up, and user acceptance (Baldauf & Stair, 2009: 200). For many organizations, this includes purchasing software, hardware, databases, and other IS components (Stair, et al., 2012: 40).

When the ICT project is ready to be converted, designers or developers have several options. These options include: 1) direct conversion which involves stopping the old system and sharing the new system on a given date; 2) phase-in conversion where the new system is slowly phased in while the old one is slowly phased out; and 3) pilot conversion which involves running a pilot or small version of the new system along with the old (Baldauf & Stair, 2009: 207). All these implementation activities are considered in the present study in order to determine if HEIs observe similar strategies in the implementation of outsourcing and in-house development of information systems.

Documentation is another important area considered in the present study. Documentation serves as a method of communication among the people responsible for developing, implementing, and maintaining a computer-based system. For instance, Installing and operating a newly designed system or modifying an established application requires a detailed record of that system's design. Documentation is extremely important in diagnosing errors and making changes, especially if the end users or systems analysts who developed a system are no longer with the organization. Sample data entry display screens, forms, and reports are good examples of documentation (O'Brien & Marakas, 2011: 513). End-user documentation is of critical importance to the user-friendliness of an application, and in this regard, the issue of quality documentation from ICT outsourcing needs considerable improvement (Arshad, et al., 2007: 122).

On assessment of information systems, its goals is to understand what was successful about the system and the project activities (and therefore should be continued in the next system or project) and what needs to be improved. Assessment can be an important component in organizational learning because it helps organizations and people understand how to improve their work (Dennis, Wixom & Roth, 2012: 495). As linked to the present study, assessment is determined with the idea that information systems need to sustain its functionality and usability. As tools to support administrative functions of HEIs, these system have to be continuously sound and reliable in order to keep the operations and business activities of HEIs running.

Another area of practices considered in the study is cost management. Cost management includes developing and managing the project budget. This area involves resource planning, cost estimating, cost budgeting, and cost control (Reynolds, 2010, 74). Furthermore, cost management includes processes required to ensure that a project team completes a project within an approved budget (Schawlbe, 2011: 256). The cost management processes for a project include: 1) Estimating costs which involves developing an approximation or estimate of the costs of the resources needed to complete a project; 2) Determining the budget which involves allocating the overall cost estimate to individual work items to establish a baseline for measuring performance; and 3) Controlling costs involves controlling changes to the project budget. These processes of cost management has been subjected to investigation in the present study to determine how HEIs perform cost management of there IS projects.

The present study has significantly considered risk management. IT assets are exposed to risk of damage or losses (Nikolić & Ružić-Dimitrijević, 2009). As the complexity of systems development increases, so do the number and severity of risks (Nelson, 2012: 75). ICT-enabled projects are frequently regarded as high risk due to their complexity and a comparatively high failure rate in terms of being delivered on time, to budget and to specification (Legislative Assembly of the

Northern Territory, 2014: 43). With the preceding issues on IT risks, risk management is therefore imperative in any IS projects.

Risk management is the process of assessing and addressing the risks that are associated with developing a project (Dennis, et al., 2012: 78). Schwalbe (2011: 495) defined risk management of a project as the art and science of identifying, analyzing, and responding to risk throughout the life of a project and in the best interests of meeting project objectives. It involves six major processes: risk management planning, risk identification, qualitative risk analysis, quantitative risk analysis, risk response planning, and risk monitoring and control. Similarly, Gray & Larson (2009: 199) identified the risk management process: step 1 risk identification, step 2 risk assessment, step 3 risk response development, and step 4 risk response control.

For an effective risk management, the prime focus should be on planning to avoid future problems rather than solving the current problems (Arshad, et al., 2012: 124). Consequently, different types of risks may originate from internal organization activities or from organization environment (Prado, 2011: 607). In outsourcing of information systems (IS) services, a strategic decision has to be seriously considered because of the many risks associated with each step of the outsourcing process. Sometimes a change in a business process requires the organization to carry out an outsourcing project (Al-Ahmad & Al-Oqaili, 2013: 230). Literature show that risk management is equated to vendor selection. Managers have to pay attention to select a vendor with appropriate expertise and experience as well as matched cultural and other needs (Herath & Kishore, 2009: 317). Said risk may also happen to in-house developed systems. In-house developed information systems are on the increase and security has become a major concern in recent years (Mushi & Bakari, 2012: 1).

The above-mentioned risk management processes has been the reference in determining the risk management practices of HEIs in their IS projects either, outsourcing or in-house development.

The present study also examines the performance of information systems due to their significance as outcomes of selecting outsourcing acquisition method and in-house development acquisition method. Specifically, evaluation of Information System performances means evaluation of performances in hardware, software, computer networks, data and human resources (Plastisa & Balaban, 2009: 11). In achieving quality system performance, many issues must be addressed such as: volumes of data and transactions the system is capable of handling; number of simultaneous users the system can handle; projected growth rate in the number of users; type of equipment the system can run on; and response time for different aspects of the system under different circumstances (Schwalbe, 2007: 295-296).

The above-cited literature on management strategies and practices in outsourcing and in-house development are regarded to be the foundation of the development of Information Systems Acquisition Decision Model. Various literature support the significance of this Model. Rahardjo (2006: 1) pointed out that many IT projects have failed because of false selection of the development. This premise implies a careful and well-thought planning and decision-making before it will consider outsourcing method or in-house development method in acquiring information systems. Each organization must decide if they can achieve a true competitive advantage with a traditional in-house system or should they change their business processes with an ERP system (McManus, 2003).

Consistent with the above premise by Rajardo, the present study adopted various theories and models which served as anchorage in the conceptualization of the present study. These theories and models provided further information on the management of information systems, both in-house development and outsourcing acquisition methods.

In the context of information systems management, the present study considered the Software Project Management (SPM) by Futrell, Shafer & Shafer (2001), as cited by Shaikh & Ahsan, (2015: 118). The Software Project Management (SPM) is a specialization of general management studies that utilizes the typical management skills of planning, organizing, staffing, leading or directing, and controlling to achieve defined project objectives. It encompasses the knowledge, techniques, and tools necessary to manage the development of software products (Kalaivani S. & Kavitha S., 2015: 1001).

The principle of IT Governance also provided a significant information on information systems management. IT Governance is defined as a decision-making process that involves investments in IT. It includes defining the decision-making process itself, as well as defining who makes the decisions, who is held accountable for results, and how the results of decisions are communicated, measured, and monitored (Reynolds, 2010: 118). Yanosky & Caruso (2008: 1) articulated that there has been an increasing attention of how IT is governed in higher education institutions for over the past few years. This indicates that the implementation of information system in HEIs should adhere to the principle of IT Governance since information systems basically use different information technologies. IT Governance identified five key activities needed for effective IT governance, namely: 1) risk management, 2) resource management, 3) performance measurement, 4) strategic alignment, and 5) valued delivery (Reynolds, 2010: 121).

The Theoretical Model for Information Administration of Krishnaveni and Meenakumari (2010: 284) showed how information administration is performed in HEIs using information systems. Krishnaveni and Meenakumari mentioned that information administration is one part of overall administration of education institutions which mainly covers general and day-to-day operational activities. The Model integrates the functional areas of information administration that are of great significance for day-to-day management of higher education institutions, namely: 1) Student administration, 2) Staff administration, and 3) General Administration. This model is significant to the present study since information administration is perceived a crucial task which could be affected by the choice of IS acquisition, whether by means of outsourcing or in-house development. This implies a careful decision should be made in the acquisition of information systems by HEIs.

The "Make-or-Buy" decision for IS/IT investment support the present study in the context of decision making for information system acquisition. According to Sena & Sena (2010: 1), the make-or-buy decision is a classic management issue. Every firm uses thousands of inputs, and for each there is a potential to either manufacture the input or acquire it on the market. In its broadest interpretation, this decision includes choices like hiring a consultant or employing internal labor to perform a given task. If a firm decides to make an input, it will transact internally with a division or another part of the firm. If it decides to buy, it will contract with another organization. In either case, it is important to understand the decision criteria behind the transaction. Moreover, the "Make-or-Buy" decision implies a number of considerations and factors when investing in information systems which may include processes, technical and non-technical resources, management strategies, etc. The question, "should an organization design and develop its own custom applications that address its specific compliance and quality needs (Build), or should it purchase a pre-made package from an outside software firm (Buy)?" (Cincom, 2008: 1) is a critical issue that must be carefully addressed. Hence, every decision made requires enormous investigations and assessments prior to deciding on the choice IS acquisition, whether outsourcing or in-house development.

The Transaction Cost Theory (TCT) developed by Williamson (1985) is one relevant theory information systems outsourcing. This theory defines that transaction costs are related to the effort, time, and costs associated with searching, creating, negotiating, monitoring, and enforcing a service contract between buyers and suppliers (Dhar & Balakrishnan, 2006: 41). TCT Model suggests that firms and individuals seek to economize on transaction cost, much as they do on production cost (Laudon & Laudon, 2012: p. 89). This theory tries to establish the idea that an organization, like in the case of HEI, should consider the inclusion of all types of costs as these costs are equated to the overall cost of system development.

The Unified Framework for Outsourcing Governance developed by Meng, He, Yang and Ji (2007), as cited by Garcia, Vicente, & Aragones (2013: 40) is a model relevant to ICT outsourcing. This model presents a unified framework on the governance of outsourcing from the combined perspectives of the customer and the provider. The framework focuses on three areas: governance processes; organizational structure of governance; and performance measurement.

The Technology Acceptance Model (TAM) originally proposed by Davis in 1986 is another most used theory in Information System research (Oliviera & Martins, 2011: 110). Technology Acceptance Model, developed by Davis (1989), is one of the most influential research models in studies of the determinants of information systems and information technology acceptance to predict intention to use and acceptance of information systems and information technology by individuals. In the Technology Acceptance Model, there are two determinants including perceived ease of use and perceived usefulness. Perceived usefulness is the degree to which an individual believes that using a particular information system or information technology would enhance his or her job or life performance. Perceived ease of use is the degree to which a person believes that using a particular information system or information technology would be free of effort (Chen, Li & Li, 2011: 124-125). This theory supports the present study in the context of Information System (IS) implementation. Regardless of IS mode of acquisition, utilization of IS in the administrative and academic operations should be helpful in performing the tasks and deliver efficient and effective results. Hence, this theory applies both IS outsourcing and in-house development. Figure 2 depicts the original TAM.

Another model adopted in the present study is the ISO 9126 Model. In the present study, this Model was used as basis in the evaluation of the performance of the in-house developed and outsourced information systems of HEIs. ISO 9126 is an international standard for software quality evaluation (Alrawashdeh, et al., 2013: 3; Trichkova & Stoilova, 2013: 65). ISO 9126 was originally developed in 1991 to provide a framework for evaluating software quality (Titthasiri, 2014: 590). ISO 9126 specifies 6 characteristics namely Functionality, Reliability, Usability, Efficiency, Maintainability and Portability. However, the present did not consider the portability, instead added the sustainability criterion. As defined in the ISO 9126 standards, Functionality is 'the capability of the software to provide functions which meet the stated and implied needs of users under the specified conditions of usage'; Reliability is 'the capability of the software product to maintain a specified level of performance when used under specified conditions'; Usability is 'the capability of the software product to be understood learned, used and attractive to the user, when used under specified conditions'; and Efficiency is 'the capability of the software product to provide appropriate performance, relative to the amount of resources used, under stated conditions' (Fahmy, et al., 2012: 118-119). In addition to the ISO-based criteria, the sustainability criterion was included. This is done in order to achieve benefits such as cost reduction, risk avoidance and improved reputation for IS management (Erek, et al., 2009: 1).

For in-house development, the Systems Development Life Cycle (SDLC) Model is widely used. The SDLC is a common methodology for systems development in many organizations; it features several phases that mark the progress of systems analysis and design effort (Hoffer, George, & Valacich: 2001:35). The key activities in the SDLC Model include 1) planning, 2) analysis, 3) design, 4) implementation, and 5) maintenance. These activities has become the bases in the formulation and/or identification of the management strategies and practices asked in the present study.

For the model development, this part of the study is anchored on Process Modeling. This model consists of the basic steps used for model building: 1) model selection; 2) model fitting; and 3) model validation. These three basic steps are used iteratively until an appropriate model for the data has been developed. (Engineering Statistics Handbook, 2013). On the other hand, Marion (2008:3) identified the process of modeling into four broad categories, namely 1) building, 2) studying, 3) testing, and 4) using. These stages of modeling have become the reference in formulating the model in the present study.

These above various literature have brought impact in the pursuit of this research and had provided direction to the present investigation.

Related Studies

Many studies have dealt with the characteristics of the two methods of acquisition of Information Systems.

Studies showed that the information systems that had been acquired, either outsourcing or in-house development, for various applications to support the academic and administrative activities of the universities/colleges. According to Chaushi, et al., (2015, 17), many universities are investing in integrated application systems, ERP's, to integrate all functional areas of the institution. In higher education, the major services supported by information systems include one or more of the following: Student Lifecycle Management (SLM), Learning Management Systems (LMS), Human Resources (HR), Finance, Library services, Student Information, Content Management System (CMS). Similarly, the study of Oboegbulem & Godwin (2013, 191) on the application of ICT in the management of universities North-Central State of Nigeria showed that all agreed on the application of ICT in the management of their respective universities. These application of ICT consisted the following: registration of students (mean 2.98);

Allocation of hostel accommodation (mean 3.06); Accessing of result online (mean 3.27); Communication among students and lecturers (mean 3.05); The use of ICT for computation of result (mean 3.14); The use of ICT for records keeping (mean 3.43); Orientation of new students (mean 3.12) Counseling services (mean 3.36); Filling of personal data (mean 3.23), and Use of ICT for publication of results (mean 3.05).

Bakeer and Wynn (2014: 167-168) also conducted the study on the utilization of ICT in Libyan universities, Misurata and Al-Mergab. The study revealed that the top level processes supported by ICTs in two universities and these include: (1) teaching and learning, (2) students records management, (3) information management, (4) estate planning & management, (5) logistic management, (6) human resources management, (7) and finance management The results further revealed the systems profile. There were some in-house developed system, particularly those that support the student records management and financial processes and functions. Some of the in-house developed systems, like in-house portal which allows students of the College of Engineering to edit and modify certain designated information regarding their courses and personal details, were not integrated nor interfaced with each other, leading to problems of data inconsistencies and multiple data updates. The Human Resource Management process was supported also by an in-house developed system using the Visual Basic and Delphi programming languages, with an underpinning SQL database. It could keep and report staff records, however it is a stand-alone system isolated from the University's network where data is gathered manually and organized by administrative staff using MS WORD or Excel before entry into the in-house system. The Financial Management process was the most automated, with the majority of activities and procedures supported by systems developed in house (again in Visual Basic and Delphi) and/or in MS WORD and Excel.

In the context of outsourcing of ICT projects, Khidzir, et al. (2013: 220) revealed in their study that 57.3% of the ICT projects being outsourced concerned Application System Development, ICT Infrastructure Maintenance (26.4.3%), IT/IS Strategic Planning Results (6.4%), ICT Security Maintenance (5.5%), ICT Knowledge Transfer & Training (2.7%) and ICT Application Maintenance at 1.8%. It was further shown that most of the project durations were medium-term being between 1 to 3 years (62.7%), while short-term (less than 1 year) and long-term (more than 3 years) represented 18.2% and 19.1% respectively. In view of this result, Khidzir, et al. made an interpretation that medium-range ICT project duration was the preference of the organizations over long-term duration due to raid changes in ICT and the market environment. It was also found out that organizations had ICT outsourcing projects that would cost between RM 1 Million to RM 5 Million (23.6%). Along this line, the researchers made an implication that the organizations' preference for medium-term ICT outsourcing project duration compared to long-term duration may be due to the rapid changes in ICT and the market environment.

Mercado, et al. (2012: 4), on their study of ICT maturity of HEIs in selected regions in the Philippines, identified the application domains of ICT, namely core academic matters and institutional services. The core academic matters, which were found 'moderately mature' (overall mean 2.98), consisted the areas of administration and management, teaching and learning, and research. On the other hand, the institutional support services domain, which were 'moderately mature' (overall mean 3.12) consisted the areas planning and monitoring tools, academic information services, ICT infrastructure, ICT financing, and Training, research and development in ICT.

On current practices on the software projects development at the Malaysian Public Sector, Doraisamy, et al. (2014: 17) identified that 55.6% is outsource software project whereas in-house development is 44.4% only. There was a difference of around 11.2% between the two methods of software projects development. This implies that many organizations would acquire IS projects through outsourcing method.

Ruchkin (2012: 14) had his observations on the state of in-house developed software for S-Trans, an international logistics company established in 1995 – 1996 in Moscow, Russia. The results revealed a number of technical issues for in-house development of software, to wit: 1) Unmanageable source code – internal system's code had grown unsuitable for reading, understanding the high-level intent, and business logic extraction; 2) An eroded database schema – many tables and fields were obsolete; 3) Low performance – the system did not meet end users' performance needs and the database performance became a bottleneck due to the growth of users; 4) Poor runtime stability – bugs did not get sufficient treatment for long periods of time; 5) Insufficient computing environment flexibility – internal system could be deployed on a small variety of hosts which made deployment of the system at warehouses in China for a more precise tracking of containers with goods impossible due to intermittent and low-bandwidth Internet connection at the warehouses; 6) Difficulties with updating thick clients – appropriate technical solution for updating thick clients was difficult and such updating of the system would result distraction to the users.

The above-mentioned findings are relevant to the present study by means of providing information on how information systems are used in the organizations, like the HEIs. Moreover, the data shown on system profile for outsourced and in-house developed system specifically on the business processes and services supported by information systems, project duration, project cost, and the method of software projects development are similarly determined in the present study.

In addition to application of information systems in HEIs, various studies have also established the specific strategies employed in the management of information systems along the areas of planning, organizing, directing, controlling, and monitoring and evaluation.

Nawi, et al. (2012: 74) conducted the study that considered the views of project stakeholders relative to government ICT project failure. The results of the study found out that project was given without any prior feasibility study due to absence of project selection process. Furthermore, the results of the qualitative analysis revealed the importance of project planning when some of the respondents highlighted the following comments: doing a strategic approach to project selection would provide better results and eventually minimize failure risks and maximize potential project success; selection of the project is not based on government strategic plan such as the NKRA, NKEA and etc; in most cases for project selection, there was an absence of an appropriate ICT project evaluation process on the part of the government; no business process reengineering (BPR) takes place before the project starts; and there was no standard methodology used during the project execution.

In organizing for outsourcing of information systems, Smuts, et al. (2010: 151), in their study on information systems outsourcing issues in the communication technology sector, revealed the preparations performed by research participants prior to outsourcing. It indicated most of research participant documented the relationship model, processes and plan prior to outsourcing. The documentation of relevant risks and rewards, as well as the screening of the vendor for cultural fit to the organisation, were included also. An exit strategy was also documented prior to the outsourcing and identified and documented intellectual property.

On monitoring and controlling strategies, Doraisamy, et al. (2014: 17-18) conducted a survey that described how many ICT departments at Malaysian

Public Sector are having software projects monitoring processes. The results showed that almost 48.6% of respondents agreed that there is a monitoring processes on the software projects developments as determined by the software projects managers. These processes were not standardized. Moreover, 22.2% of respondents mentioned that they did not have any monitoring process taken place during the software projects development. Almost 70.8% of respondents stated that there was a need for software project monitoring methodology at Malaysian Public Sector. Also, 83.3% of the response rate showed that Malaysian Public Sector departments and ministries need improvement on current monitoring processes.

On importance of having software project monitoring methodology, the above study revealed that almost 94.4% of respondents agreed and 5.6% of respondents strongly agreed that the development of software projects needs to be monitored regularly. Moreover, 87.5% of respondents agreed and 12.5% strongly agreed that Software projects monitoring methodology is needed in order to monitor and control the software projects development. Whereas 84.7% of respondents agreed and 15.3% strongly agreed that software projects monitoring methodology could help them and their team to manage and monitor the software projects development processes at their departments. The results implied that software projects monitoring methodology could help the project manager and his team members to produce a successful software projects.

The above findings provided evidences how outsourcing and in-house development of information systems are managed along the planning, organizing, directing, controlling, and monitoring and evaluation strategies. The statistics showed provided a better understanding of the problem being investigated in the present study, particularly on management strategies.

In addition to management strategies, many studies were also conducted and provided significant findings along practices for outsourcing and in-house development of information systems.

On requirements determination of the information systems, Nawi, et al. (2012: 72) identified that not meeting the user requirement were common issues arising in most of the ICT projects of Malaysian government. One respondent opined that not meeting the user requirement was caused by the failure of the vendor in generating user involvement in the project, especially during the user acceptance test. In effect, users were using the system after it has been implemented due to failure in not meeting their requirements and work process. In addition, the users complained that the vendor failed to meet their expectations.

The above results strongly indicate the need of involving users during the requirements determination stage of ICT projects, whether through outsourcing or in-house development. Hence, present study considered the requirements determination aspect of IS projects in HEIs with emphasis on user involvement.

Documentation is another major issue in IS development. The study conducted by Arshad, et al. (2007: 122) revealed that many service providers are unable to provide complete project documentation. The main reason given was that there was no specific standard defined for preparing the project documentation. Moreover, documentation provided by some service providers were difficult to understand (owing to technical terminology used) or failed to meet user requirements.

Another significant factor in outsourcing of information systems is the cost. Along this line, Correia dos Santos and Mira da Silva (2012: 12) found out that approximate costs in IT outsourcing are calculated for the full contract duration at market prices when the provider intends to sign the contract, allocating the resources to answer customer requirements. Also, it was identified that cost allocation is driven by the requirements of financial cost reporting. This fact limits the provider's ability to identify and manage the contract's costs. In the study of Smuts, Kotze, & Merwe (2010: 153), several focus areas were identified that research participants would consider if they had the opportunity to initiate the outsourcing process again. One of the areas identified was the outsourcing costs. The research participants stated, "Outsourcing costs not included in the standard outsourcing agreement should be better managed. Poor scoping and prioritisation of requirements in this area may result in cost escalation and not achieving one of the reasons for IS outsourcing, i.e. cost reduction."

On risk management, Nawi, et al. (2012: 72-74) mentioned that controlling and managing risk in ICT projects is considered to be a major contributor to project success. Their study showed significant findings relative to risk management. In the analysis, one of the respondents highlighted the cause of project failure was not managing the project risk until it became a problem. One of the examples given was the project falling behind schedule due to the vendor's inability to deliver the product due to shipping problems. The study also showed the importance of vendors in achieving a successful IT project. One respondent asserted that they're looking forward to working with the right vendor in the future to ensure the quality in terms of interoperability and compatibility. This statement implies that a good selection of vendors or service providers, either in outsourcing or in-house development, is important in ensuring IS project's success.

On the risk for outsourcing of ICT project, Arshad, et al. (2007: 124) made a conclusion that it is essential for governments to utilize a solid governance approach in managing outsourcing process to avoid many potential pitfalls. Such a regulatory framework may pave the way for a secured and successful deployment of ICT outsourcing with proper risk management and strong enforcement of policies and procedures.

Risks similarly occur in in-house developed information systems. From the analysis and discussions of the findings of the study done in three (3) organizations in Tanzania, Mushi & Bakari (2012: 4) on security in in-house developed Information Systems, the authors made the following conclusions that in-house information systems developers were not effective in ensuring information systems security and it made number one sources of information system flaws, professionals employed in organizations have no background in information systems security and enough experience to ensure that the information systems developed and installed in their systems are secure, and management has no idea of the connection between possible risks posed by such systems and how such risks can affect organizations in achieving their strategic objectives.

Many studies have also dealt with evaluation of information systems, either outsourced or in-house developed. Chua and Dyson (2004: 187) evaluated e-learning system using the ISO 9123 Model. The results of the evaluation showed that many flaws with the system were discovered. Some of those were critical to user satisfaction and some are minor. It was concluded that the ISO 9126 model could provide useful information to educators and administrators of the quality of a system they would likely to buy and could provide basis for informed and rational decision making to avoid costly mistakes. This study of Chua & Dyson provided strong justification of using ISO 9126 Model in evaluating information systems. Hence, such Model was used in the present study.

Daneshgar, et al. (2011) investigated on 'Build vs. Buy' decision for software acquisition by Small to Medium Enterprises. The study revealed important factors that respondents would take into consideration when deciding on the software acquisition method. The results showed that 'time' factor was considered as a major factor but it depends on the type of system to acquire according to one respondent. Furthermore, majority of respondents agreed that in-house development takes longer time. All respondents confirmed that the presence of the inside expertise would motivate in-house development. Another factor treated was the scale and complexity of the system. One respondent revealed of the limitations of in-house development method which made the developed system unsuccessful due to its limitations like the lack of ubiquitous access to the system.

The above study is relevant to the present study as it provides significant information in deciding for in-house development. This indicates that HEIs should consider these factors prior to acquiring information systems by means of in-house development.

Sena & Sena (2010: 7) conducted similar study that dealt with "make-or-buy" decision in software acquisition was This study compares the characteristics of organizations that tend to "make" versus those that tend to "buy" software. The study tested whether an organization's preference for buying software vs. developing in-house have a relationship with their perceptions on the success of IT investments, the management of IT projects, and the mechanisms that effectively measure and justify IT expenditures. The results of the test showed that there was no significant correlation between organizations that buy software and perceptions regarding the success of IT investments, the effectiveness of IT project management, and the use of mechanisms that effectively measure and justify IT expenditures. This means that the success of IT investments, the effectiveness of IT project management, and the use of mechanisms that effectively measure and justify IT expenditures are not affected by the method of software acquisition, regardless of outsourcing and in-house development.

Sena & Sena further concluded that organizations that buy packaged software were perceived as being less efficient than those who developed software internally in the collection, storage, and dissemination of data to support business operations. However, they did not differ in perceptions on the use of technological resources to help decision makers gain strategic insights.

The above results in the study of Sena & Sena provide relevant information to the present study particularly in determining whether there is a significant difference in performance of the outsourced and in-house developed information systems of HEIs. Somehow, success of IS investments and its effectiveness can be addressed.

While the above findings and theories and models provided strong foundation in the conceptualization of the present study, the methodology used of these studies were equally relevant. The descriptive research design used is similarly employed in the present study. The use of questionnaire and qualitative analysis through interviews and observations in order to gather pertinent data and information were also employed in the present study. Finally, the literature review employed in the above studies likewise observed in the present study in order to establish a theoretical framework that could support the present study especially in the identification of the objectives, variables and methods.

Chapter 3

METHODOLOGY

This chapter presents in details the methods and procedures that will be used in the conduct of the study. It presents the research design, instrumentation, validation of the instrument, sampling procedure, data gathering procedure, and statistical treatment of data.

Research Design

The research design used in the conduct of the study was descriptive-development research.

The descriptive design focuses at the present condition and provides essential knowledge about it. It normally employs data gathering instruments such as questionnaire, interviews, observation schedule, checklist, score cards, and rating scale (Calmorin & Calmorin, 1995: p. 45). The present condition being described in the present study are the management strategies and practices in outsourcing and in-house development of information systems of HEIs in the island of Samar. From the findings of the study, the new knowledge was generated. This knowledge pertains to the actual and real scenario of management strategies and practices in outsourcing and in-house development of information systems in of HEIs.

The present study also employed development research design since its end goal was the development of Information System Acquisition Decision Model based from the results of the survey. Said Model contained relevant items that would help HEIs in the decision-making process for IS acquisition, whether they will outsource or locally develop (in-house) their information systems.

The study included HEIs in the Island of Samar with information systems presently used and there were a total of thirteen (13) of them that participated in the study, all coming from the three cities and two municipalities of Samar Island. These HEIs were surveyed in terms of management strategies and practices in outsourcing or in-house development of their information systems. In addition, these HEIs were subjected to evaluation of information system performance. The distribution of HEIs is shown in Table 1.

Table 1

List of Higher Education Institutions in the Island of Samar with Information Systems

	Higher Education Institutions	Location
SUC HEIs		
1	Samar State University – Main Campus	Catbalogan City, Samar
2	Northwest Samar State University – Main Campus	Calbayog City, Samar
3	Eastern Samar State University – Main Campus	Borongan City, Eastern Samar
4	University of Eastern Philippines – Main Campus	Catarman, Northern Samar
5	University of Eastern Philippines – Catubig Campus	Catubig, Northern Samar
6	University of Eastern Philippines – Laoang Campus	Laoang, Northern Samar
Private HEIs		
7	St. Mary's College of Catbalogan	Catbalogan City, Samar
8	Samar College	Catbalogan City, Samar
9	Christ the King College	Calbayog City, Samar
10	St. Mary's College of Borongan	Borongan City, Eastern Samar
11	Northern Samar Colleges	Catarman, Northern Samar
12	Global School for Technological Studies	Catarman, Northern Samar
13	East Pacific Computer College	Catarman, Northern Samar

From the list of HEIs in Table 1, the respondents who answered the questionnaires on management strategies and practices of IS outsourcing or in-house development of information systems and the evaluation of information system performance were selected.

Instrumentation

The research instrument used were questionnaire and observation sheet for the physical evaluation of the information systems.

A researcher-made questionnaire was used to gather relevant data in order to answer the problem in the study. The items in the questionnaire were developed from the information obtained from literature review based on the research questions outlined in the statement of the problem of the present study. The questionnaire used in the study was divided into three (3) parts. The first part of the questionnaire was the profile of HEI. This part sought to gather data on the following: 1) current IS utilization; 2) mode of IS project acquisition; 3) IS implementation duration; 4) allocated budget for IS; 5) IS management structure; and 6) operation. The second part determined the management strategies utilized by HEIs for outsourcing and in-house development of information systems. The management strategies considered were the following: 1) planning; 2) organizing; 3) directing; 4) controlling; and 5) monitoring and evaluation (M&E). On this part of the instrument, the following range of values is established for the scales used in order to arrive at a definite interpretation of the scales.

Scale	Mean	Description
5	4.51 – 5.00	Fully Implemented (FI)
4	3.51 – 4.50	Highly Implemented (HI)
3	2.51 – 3.50	Moderately Implemented (MI)
2	1.51 – 2.50	Slightly Implemented (SI)
1	1.00 – 1.50	Not Implemented (NI)

The preceding scale has the following meaning: Fully Implemented (FI) means that the strategy is 100% implemented; Highly Implemented (HI) means that the strategy is 75% implemented; Moderately Implemented (MI) means that the strategy is 50% implemented; Slightly Implemented (SI) means that the strategy is 25% implemented; and Not Implemented (NI) means that the strategy is not implemented at all.

The third part determined the practices of outsourcing and in-house development of the information system of HEIs. The practices were determined on the following aspects: 1) requirements determination; 2) implementation; 3) documentation; 4) assessment; 5) cost management; 6) and risk management. In order to arrive at a definite interpretation about the practices of outsourcing and in-house development of the information, the scale was used.

The scale on practices has the following meaning: Always (AP) means that the condition is 100% practiced or practiced all the time; Often (OP) means that the condition is 75% practiced or frequently practiced; Sometimes (SP) means that the condition is 50%

practiced or not occurring very often; Rarely (RP) means that the condition is 25% practiced or practiced on some occasions only; and Not Practiced (NP) means that the condition is not practiced at all.

Scale	Mean	Description
5	4.51 – 5.00	Always Practiced (AP)
4	3.51 – 4.50	Often Practiced (OP)
2	1.51 – 2.50	Sometimes Practiced (SP)
3	2.51 – 3.50	Rarely Practiced (RP)
1	1.00 – 1.50	Not Practiced (NP)

For physical evaluation, the study made use of observation sheet containing items that determined the performance of outsourced and in-house developed information systems of HEIs. The system performance was measured using the following criteria: 1) functionality; 2) reliability; 3) usability; 4) efficiency; and 5) sustainability. The first four criteria were adopted from ISO 9126 Model, while the last was just an add-on. This guide sheet was used side-by-side with observation and demonstration.

In addition to the questionnaire and observation sheet, the interview technique was employed. The interview was used to reinforce the study with further information. It helped to gather in-depth information from the respondents regarding the management strategies and practices in outsourcing and in-house development of ICT projects of HEIs.

Validation of the Instrument

The validation procedure of the questionnaire was performed in order to determine the appropriateness of the content of the instrument.

In order to test the validity of the questionnaire, the researcher conducted the pilot survey/dry-run to the following HEIs in Leyte: Eastern Visayas State University, Leyte Normanl University, Visayas State University, Palompon Institute of Technology, Asian Development Foundation College, Western Leyte College, Saint Joseph College, and Leyte Colleges. These selected HEIs have outsourced and in-house developed information system, making them suitable for the conduct of dry-run.

The results of the dry-run were analyzed and subjected to reliability test using Cronbach's Alpha Coefficient. The reliability test of the questionnaire for outsourcing showed an excellent reliability as indicated in its overall coefficient of 1.000536698, while the questionnaire for in-house development similarly showed an excellent reliability as indicated in its overall coefficient of 0.974597291. The result of validity test indicates that there is a consistency of the answers made by the respondents on the items in the questionnaire and the respondents understood well the questions in the questionnaire. Such result emerged due to the adoption of relevant information from various literature about the strategies and practices employed in in-house development and outsourcing of information systems. The questionnaire was revised by incorporating the suggestions made by the respondents in some items of the questionnaire. The revised questionnaire was submitted to the researcher's dissertation adviser and was further refined and approved before they were fielded.

On the other hand, the observation sheet developed as instrument to measure the performance of the system was subjected to expert validation. The researcher developed the observation sheet based from reviewed literature on system performance and ISO 9126 Model. The initial version of the observation sheet was presented to a group of IT faculty of the College of Information Technology (CIT) of the Northwest Samar State University in Calbayog City. Each of the experts made his/her corrections and suggestions to further improve the items in the observation sheet. Upon revision, the final copy of the observation sheet was prepared and presented to the Dean of CIT for approval.

Sampling Procedure

The total enumeration was employed in determining the respondents. All those who have direct involvement and participation in the decision-making on acquisition and implementation of IS projects of HEIs were selected. Hence, the researcher included some administrators, MIS/IT Head & staff, IT faculty, and personnel from different offices like the Registrar's Office, Cashier's Office, and Accounting Office as users of the system.

Data Gathering Procedure

The following procedures were followed in the conduct of the study.

Initially, the researcher wrote a letter to the CHEDRO VIII requesting for the list of HEIs operating in the island of Samar. Said list was used to determine the HEIs that would be involved in the study. The list has been also the basis in determining which HEI have information systems presently used.

Upon identification of HEIs with outsourced and in-house developed information systems, the researcher made a request to the Presidents of these HEIs to conduct the study. Upon approval, the researcher personally administered the questionnaire to explain the purpose and discuss the manner of answering the questions. In addition to questionnaire, the interview and physical observation of the system were conducted. The distribution of respondents per HEI is shown in Table 2.

Table 2

Distribution of the Respondents of the Study

Higher Education Institution	N
1. Samar State University – Main Campus	11
2. Northwest Samar State University – Main Campus	10
3. Eastern Samar State University – Main Campus	27
4. University of Eastern Philippines – Main Campus	37
5. University of Eastern Philippines – Catubig Campus	1
6. University of Eastern Philippines – Laoang Campus	1
7. St. Mary's College of Catbalogan	3
8. Samar College	7
9. Christ the King College	6
10. St. Mary's College of Borongan	1
11. Northern Samar Colleges	4
12. Global School for Technological Studies	4
13. East Pacific Computer College	3
TOTAL	115

The data from the retrieved questionnaire were tabulated, analyzed, and interpreted; the data obtained from the interview and physical evaluation/observation of the outsourced and in-house developed systems were summarized.

Statistical Treatment of Data

The following statistical techniques were used in the processing of data:

To describe the profile of HEIs, in terms of current IS utilization and operation, frequency and ranking were utilized, while in terms of mode of IS project acquisition, IS implementation duration, allocated budget for IS, and IS management structure, frequency and percentage distribution were used.

To determine the management strategies and practices of outsourcing and in-house development, the weighted mean was employed.

To determine the performance of outsourced and in-house developed information systems in terms of functionality, reliability, usability, efficiency, and sustainability, the relative frequency was employed.

To determine the significant difference in the performance of outsourced and in-house developed information systems, t-test for independent variables was employed.

Chapter 4

PRESENTATION, ANALYSIS AND INTERPRETATION OF DATA

This chapter presents, analyzes, and interprets the data gathered from the respondents of the study. The data for the profile of HEIs, management strategies, and practices of in-house development and outsourcing of information systems were collected through the questionnaire and interviews, while the data for the performance of the information systems were gathered through observations/physical evaluation and interviews. The data were presented in tabular and graphical forms, accompanied by statistical analyses with their corresponding interpretations.

Profile of Higher Education Institutions (HEIs)

The profile of HEIs in the Island of Samar was drawn from the variables such as current IS utilization, mode of project acquisition, implementation duration, budget allocation, management structure, and operation. These variables are presented in tables and specifically discussed below.

Table 3 shows the profile of HEIs in terms of mode of IS project acquisition, implementation duration, budget allocation, and management structure.

The results revealed that out of the 13 Information System projects, 7 (53.85 percent) of these were acquired through outsource development, while 6 (46.15 percent) through in-house development.

Table 3

Profile of the of HEIs in terms of Mode of IS Project Acquisition, IS Implementation Duration, Allocated Budget for IS, and IS Management Structure

Particulars	Frequency	Percentage
MODE OF IS PROJECT ACQUISITION		
In-Housed Development	6	46.15
Outsourced Development	7	53.85
TOTALS	13	100.00
IS IMPLEMENTATION DURATION (in years)		
5 and below	8	61.54
6 – 10	3	23.08
11 and above	2	15.38
TOTAL	13	100.00
ALLOCATED BUDGET FOR IS (in pesos)		
1,000,000 and below	6	46.20
4,000,000 and above	1	7.70
No Answer	6	46.20
TOTALS	13	100.00
IS MANAGEMENT STRUCTURE		
PERSONNEL ASSIGNED	10	76.92
2 and below	2	15.38
5 – 6	1	7.69
7 and above	13	100.00
TOTALS		
QUALIFIED HEAD AND PERSONNEL		
Yes	11	84.60
No	2	15.40
TOTALS	13	100.00
PRESENCE OF ORGANIZATIONAL STRUCTURE		
Yes	5	38.46
No	8	61.54
TOTALS	13	100.00

The result on model of IS project acquisition indicates that outsourcing is more preferred method of acquiring Information System by the HEIs in Samar compared to in-house development.

On IS implementation duration, 8 (61.54 percent) of the information systems have been implemented within 5 years and below, 3 (23.08 percent) for 6 to 10 years, and 2 (15.38 percent) for 11 years and above. With this result, it is evident that many of the information systems currently used by HEIs are not too mature yet, while only a few can be considered more established information systems.

On allocated budget for the Information Systems, 6 (46.20 percent) of HEIs have budget allocation within the range of PhP1,000,000 and below, 1 (7.70 percent) HEI within PhP4,000,000.00 and above, and 6 (46.20 percent) did not answer. The results imply that majority of the HEIs in Samar are capable only of investing in IS projects from a low to average cost. In contrast, only a few of HEIs in Samar can afford to invest in a more high-end and complex information system which provides more services considering a very expensive cost. Furthermore, some HEIs did not disclose the budget due to confidentiality or cannot exactly determine the budget.

On management structure, 10 (76.92 percent) of the HEIs have personnel of 2 and below, 2 (15.38 percent) have 5 to 6, and 1 (7.69 percent) have 7 and above. This implies that there is a lack of personnel to manage the system. The lacking of assigned personnel can be attributed to constraints in funding for hiring of additional personnel to manage the system. In the case of outsource development, hiring of more personnel is not necessary since the service providers directly manage the system.

On the qualification of Head and personnel of the office that manage the information system, 11 (84.60 percent) HEIs have qualified head and personnel, while only 2 (15.40 percent) have no qualified head and personnel. This means that most of the HEIs have skilled personnel that fit to their positions as administrators of the information systems. On the other hand, other HEIs have personnel, but these are not qualified to manage the system because they could not perform the technical tasks. This can be true to some HEIs that opted for outsource development wherein the in-charge of the information systems seek assistance from the service providers whenever there is a problem in the system.

For organizational structure, 5 (38.46 percent) of the HEIs have organizational structure, while 8 (61.54 percent) have not. This denotes that many of the HEIs have no scheme that defines the hierarchy of jobs, accountability, and communication relative to the management of the information systems. These HEIs that do not have established organizational structure may not have effective management of the system and the needs of the users may not be easily addressed.

Table 4 presents the profile of HEIs in terms of current utilization of the information systems.

Based from the aforementioned ranking, it denotes that among the business processes performed by the HEIs, the enrollment and records management of the students is the top priority for computerization. HEIs purposely acquire information systems to provide effective services to its clients, particularly in enrollment. Furthermore, the top 3 IS utilization imply that most the information systems are used in the administrative operation of an HEI, not in instruction.

Table 4

Profile of HEIs in terms of Current IS Utilization

Indicators	Frequency	Ranking
CURRENT INFORMATION SYSTEM UTILIZATION		
Students Enrollment and Records Management	12	1
Finance and Accounting Management	10	2
Payroll Processing	5	3
Library Services	4	4
Personnel Records Management	3	5
Medical and Dental Services	2	6
Teaching and Learning	1	7
TOTAL	37	

Table 5 shows the profile of HEIs in terms of support to the operation of the outsourced information system.

The figures show that the on-going technical support is ranked 1 with a frequency of 7. The communication between service provider and HEI and training and orientation on the use of the system are both ranked 2.5 having the same frequency of 5. Consultation with the service provider is ranked 4 with a frequency of 4. The Monitoring and evaluation of outsourcing processes, assessment of the performance of the outsourced system, reviewing the terms and conditions set in the contract, preparation and dissemination of status report, and debugging of the outsourced system are all ranked 7 with the same frequency of 3. The test-run of the outsourced system is ranked 10 with a frequency of 2. The least was documentation of systems development processes which is ranked 11 with a frequency of 1.

Table 5

Profile of HEIs in terms of Support to the Operation of the Outsourced Information System

Indicators	Frequency	Ranking
SUPPORT TO THE OPERATION OF THE OUTSOURCED INFORMATION SYSTEM		
On-going technical support, e.g. warranty and enhancement	7	1
Communication between service provider and HEI	5	2.5
Training and orientation on the use of the system	5	2.5
Consultation with the service provider	4	4
Monitoring and evaluation of outsourcing processes	3	7
Assessment of the performance of the outsourced system	3	7
Reviewing the terms and conditions set in the contract	3	7
Preparation and dissemination of status report	3	7
Debugging of the outsourced system	3	7
Test-run of the outsourced system	2	10
Documentation of systems development processes	1	11
TOTAL	39	

The analysis of the results mean that on-going technical support is the most common and a primary activity in the operation of information system outsourcing. In addition, the on-going technical support is widely implemented because it could be a major concern when an HEI engages in information system outsourcing. On the other hand, it shows that there is an HEI that do not maintain records of activities that took place during systems development. This is an indication of the potential problems and issues in outsourcing due to the absence of documentation or recording of relevant activities.

Table 6 depicts the profile of HEIs in terms of current IS utilization of support to the operation of the in-house developed information system.

The data reveal that the on-going technical support, e.g. maintenance and enhancement is ranked 1 with a frequency of 6. The monitoring and evaluation of cost, assessment of problems and risks, assessment of the performance of the developed system, and debugging of the developed system followed are all ranked 3.5 having the same frequency of 4. The training and re-training on the use of the system, documentation of changes in system development processes, and test-run of the developed system were are ranked 7 with similar frequency of 3. The preparation and dissemination of status report is ranked 9 with a frequency of 2. The least are regular meeting with system development team and frequent review of the information system development plan which are ranked 11 with a frequency of 1. In addition, one HEI indicated other support operation which is the development of new system/research.

Analysis of the above data reveals that most of the HEIs that opted for outsourcing commonly perform continuous improvement of their information systems. These HEIs considered such activity a top priority in order to keep the system always functional and continuously address their needs. On the other hand, the regular meeting with system development team and frequent review of the information system development plan are least performed because these activities do not directly affect the operation of the system, hence these activities are taken for granted.

Table 6

Profile of HEIs in terms of Support to the Operation of the In-house Developed Information System

Indicators	Frequency	Ranking
SUPPORT TO THE OPERATION OF THE IN-HOUSED INFORMATION SYSTEM		
On-going technical support, e.g. maintenance and enhancement	6	1
Monitoring and evaluation of cost	4	3.5
Assessment of problems and risks	4	3.5
Assessment of the performance of the developed system	4	3.5
Debugging of the developed system	4	3.5
Training and re-training on the use of the system	3	7
Documentation of changes in system development processes	3	7
Test-run of the developed system	3	7
Preparation and dissemination of status report	2	9
Regular meeting with system development team	1	11
Frequent review of the information system development plan	1	11
Others	1	11
TOTAL	36	

Management strategies utilized by HEIs for outsourcing and in-house development of Information System

The management strategies utilized by HEIs in outsourcing and in-house development of information system are important in order to achieve functional and efficient information systems. It is for this reason that this study attempted to assess strategies employed by HEIs in managing the processes of outsourcing and in-house development of their information systems with regards to planning, organizing, directing, controlling, and monitoring and evaluation (M&E).

Table 7 shows the management strategies utilized by HEIs for in-house development of information systems in terms of planning.

It can be gleaned from the table that all the planning indicators are highly implemented. Among the planning indicators, assessing of the current systems has earned the highest weighted mean of 3.86, while monitor and evaluate system development activities has earned the lowest weighted mean of 3.54. The results indicate that examining the current situation of HEI is regarded as the most important aspect in planning for in-house development. On the other hand, the monitoring and evaluation schemes of systems development activities is implemented but not as well enforced than the other planning activities. The grand mean 3.64 implies that the planning strategy needs to be enforced rigorously in order to achieve a full implementation.

The interview responses revealed that planning of in-house development of the information system involved several activities. The planning considered consultation and interview with users from different offices and colleges for data gathering and at the same time for assessing the status of the current systems. Such interview would also determine the need of the users and the process or operation of the area to be computerized. One MIS Head revealed that a one (1) year time table is prepared for system development, and in this time table three (3) months

Table 7

Management Strategies Utilized by Higher Education Institutions for In-House Development of Information System Projects in terms of Planning

Indicators	Ratings							Mean	Interpretation
	1	2	3	4	5	No Answer	Totals		
1. Assess current systems	0	4	14	25	14	1	58	3.86	HI
2. Conduct user need analysis	2	5	15	23	12	1	58	3.67	HI
3. Identify the system to be developed	0	5	17	20	14	2	58	3.77	HI
4. Define schedule, alternatives, and scope of the system	1	8	13	23	12	1	58	3.65	HI
5. Formulate system development team	1	6	18	17	14	2	58	3.66	HI
6. Acquire needed I.T. infrastructures	0	10	15	21	10	2	58	3.55	HI
7. Consider selection process for vendors and suppliers of the needed I.T. infrastructures	2	5	17	18	13	3	58	3.64	HI
8. Allocate funds for the acquisition of resources	1	6	17	21	11	2	58	3.63	HI
9. Monitor and evaluate system development activities	2	7	14	22	9	4	58	3.54	HI
10. Design Information System Development Plan	2	5	18	21	10	2	58	3.57	HI
	Grand Mean							3.64	HI

Legend:

4.51 – 5.00	Fully Implemented	(FI)
3.51 – 4.50	Highly Implemented	(HI)
2.51 – 3.50	Moderately Implemented	(MI)
1.51 – 2.50	Slightly Implemented	(SI)
1.00 – 1.50	Not Implemented	(NI)

was allotted for the implementation of the plan starting with the design of the system to be developed. Other HEIs considered also in planning the source and allocation of fund, layout of the Network (LAN), request for computers, and monitoring and suggestions for enhancement from end users. In the case of smaller Private HEIs, they considered in their plan to adopt students' projects due to the limited budget.

Table 8 shows the management strategies utilized by HEIs for in-house development of information systems in terms of organizing.

The figures in the table show that all indicators of organizing for an in-house development of an information system are highly implemented, except for establishing channel of communication and coordination which is moderately implemented with a weighted mean of 3.47. This indicates that there is a need to put more emphasis on establishing channel of communication and coordination in organizing for in-house development. It further shows that of all the organizing strategies, the preparation of technical resources such as hardware & software has earned the highest weighed mean of 3.82. This means that the preparation of the needed technical resources prior to the development is almost completely performed. Overall, the grand weighted mean of 3.70 implies that organizing of in-house development of information systems needs to be executed more.

Based from the interview, it was revealed that HEIs formulate an in-house development team whose members are mostly IT Faculty. During development, several equipment and other technical requirements are requested for purchase such as wi-fi, server, licensed software, operations system for networks, etc. Each member of the Team is assigned to a specific module to work on like cashiering, student registration and curriculum, grading, and maintenance and utilities.

Table 8

Management Strategies Utilized by Higher Education Institutions for In-House Development of Information System Projects in terms of Organizing

Indicators	Ratings							Mean	Interpretation
	1	2	3	4	5	No Answer	Totals		
1. Set goal and milestones of the system	1	7	13	21	15	1	58	3.74	HI
2. Assemble members of system development team	1	5	19	15	17	1	58	3.74	HI
3. Prepare technical resources such as hardware & software	1	8	10	19	19	1	58	3.82	HI
4. Gather information on vendors and suppliers of the needed I.T. infrastructures	1	10	12	13	20	2	58	3.73	HI
5. Determine tasks and activities in the development of the information system	0	7	17	17	16	1	58	3.74	HI
6. Establish channel of communication and coordination	1	10	15	23	8	1	58	3.47	MI
Grand Mean								**3.70**	**HI**

Legend:

4.51 – 5.00	Fully Implemented	(FI)
3.51 – 4.50	Highly Implemented	(HI)
2.51 – 3.50	Moderately Implemented	(MI)
1.51 – 2.50	Slightly Implemented	(SI)
1.00 – 1.50	Not Implemented	(NI)

Normally, an Office Memo coming from the President is served in performing administrative tasks relative to information system implementation. For some HEIs, an ICT/IT Department is in-charge of the development of the system; however, such department is manned by only one (1) person, the ICT Director. In order to address all the resources needed and requests from the users, one respondent mentioned that OJTs and student assistants are deployed.

Table 9 shows the management strategies utilized by HEIs for in-house development of information systems in terms of directing.

As shown in the table, to provide compensation to the members of the development team in a form of deloading, honorarium, service credit, etc. is moderately implemented with a weighted mean of 3.48, the rest are highly implemented. Among the highly implemented indicators, the assigning of tasks to qualified and skilled staff has earned the highest weighed mean of 3.93.

The above results suggest that though the tasks are assigned to the experts, there is a need to provide more training to the staff and hire more skilled personnel that can handle the developed system. Furthermore, the giving of a corresponding compensation to the personnel who develop and manage the system is not totally exercised. This case can be attributed to the limited financial resources and/or absence of such provision in an HEI. The overall weighted mean of 3.71 suggests that directing needs a more intensive execution in in-house development.

On the interview conducted along directing, it was found out that in other HEIs the members of the development team perform their duties with corresponding compensation through Special Order (S.O.) issued by the University President granting overtime pay for their service rendered. In addition, the Purchase Order (P.O.) are prepared and accomplished to procure the

Table 9

Management Strategies Utilized by Higher Education Institutions for In-House Development of Information System Projects in terms of Directing

Indicators	Ratings 1	2	3	4	5	No Answer	Totals	Mean	Interpretation
1. Assign tasks to qualified and skilled staff	3	0	15	18	20	2	58	3.93	HI
2. Provide compensation to the members of the development team in a form of deloading, honorarium, service credit, etc.	3	7	20	12	14	2	58	3.48	MI
3. Execute system development activities according to the plan	0	5	18	20	12	3	58	3.71	HI
4. Supervise tasks and activities	1	8	13	18	15	3	58	3.69	HI
5. Disseminate related information to concerned staff or office	4	18	21	13	4	2	58	3.77	HI
6. Procure technical resources, such as hardware and software, needed in the development of the system	8	15	19	14	8	2	58	3.70	HI
Grand Mean								3.71	HI

Legend:

4.51 – 5.00	Fully Implemented	(FI)
3.51 – 4.50	Highly Implemented	(HI)
2.51 – 3.50	Moderately Implemented	(MI)
1.51 – 2.50	Slightly Implemented	(SI)
1.00 – 1.50	Not Implemented	(NI)

equipment needed during the development of the system. The Head of the development team, which is the MIS Head, would supervise the activities assigned to each member of the team. Whenever the development team needs some data or information, an Office Order from the Office of the President is served to the concerned office/s to give access to records and other information. Other HEIs would designate ICT Director to facilitate the in-house development of the system. The designated ICT Director is deloaded to give focus on the system with 9 units/week and receives an honorarium. Works performed on Saturdays, Sundays, and before and after office hours are considered overtime with compensation.

Table 10 displays the management strategies utilized by HEIs for in-house development of information systems in terms of controlling.

As shown in the table, all indicators along controlling are highly implemented. Among these indicators, allowing of authorized personnel only to have access to records and documents used in the development of the information system has earned the highest weighted mean of 3.89, while to develop system based on system requirements set has earned the lowest weighed mean of 3.51. The results evidently show that the records and documents in systems development are accessed by authorized personnel only, however such strategy has to be rigidly enforced in order to make the records and documents completely secured. On the other hand, developing an in-house system based on systems requirements earned the lowest weighted mean because said strategy may not be absolutely performed during the controlling of information systems. The combined mean of 3.69 implies that controlling of information systems in in-house development needs to be extremely employed.

Table 10

Management Strategies Utilized by Higher Education Institutions for In-House Development of Information System Projects in terms of Controlling

Indicators	Ratings							Mean	Interpretation
	1	2	3	4	5	No Answer	Totals		
1. Compare system development processes and activities against the plan	2	5	19	16	14	2	58	3.63	HI
2. Compare costs against the approved budget allocation	1	7	19	16	13	2	58	3.59	HI
3. Perform system development processes and activities in a timely manner	0	10	16	13	14	5	58	3.58	HI
4. Develop system based on standards	0	8	12	24	12	2	58	3.71	HI
5. Develop system based on system requirements set	1	8	21	12	13	3	58	3.51	HI
6. Review and approve changes in systems development processes and requirements	0	5	18	18	15	2	58	3.77	HI
7. Allow only authorized personnel to have access to records and documents used in the development of the information system	0	7	14	13	22	2	58	3.89	HI
8. Keep track utilization of the physical resources like hardware and software	0	7	13	18	18	2	58	3.84	HI
Grand Mean								**3.69**	**HI**

Legend:

4.51 – 5.00	Fully Implemented	(FI)
3.51 – 4.50	Highly Implemented	(HI)
2.51 – 3.50	Moderately Implemented	(MI)
1.51 – 2.50	Slightly Implemented	(SI)
1.00 – 1.50	Not Implemented	(NI)

The results of the interview disclosed that controlling of in-house developed systems is done by ensuring that school policies are embedded in the design of the system. The development team is given total control over the system. As to the budget, controlling was not an issue. As mentioned by the MIS Director of one HEI, *"We are provided by the President with everything we need."* This implies that the IT personnel are provided by the administration with all the resources needed in the implementation of the system. On the technical aspect, controlling activities were done by means of back-up recovery to avoid problems, weekly checking of the system, and updating based from suggestions/observations of the end users.

Table 11 shows the management strategies utilized by HEIs for in-house development of information systems in terms monitoring and evaluation.

It can be observed that each of the monitoring and evaluation indicator is highly implemented. Of all these strategies, the validation of completed tasks and systems components has earned the highest weighted mean of 3.76. Meanwhile, the indicator that has the lowest weighted mean is to record completed tasks by development team members with a weighted mean of 3.58. The findings imply that the validation of completed tasks and systems components, despite of being highly implemented, should be given a thorough attention in order to avoid potential problems like the approval of activities which were not approved. Meanwhile, the recording of completed tasks by development team members requires more action. As a whole, the grand mean 3.66 attests that monitoring and evaluation in in-house development requires a rigorous action to achieve full implementation.

Table 11

Management Strategies Utilized by Higher Education Institutions for In-House Development of Information System Projects in terms of Monitoring and Evaluation

Indicators	Ratings							Mean	Interpretation
	1	2	3	4	5	No Answer	Totals		
1. Validate completed tasks and systems components	0	5	17	19	14	3	58	3.76	HI
2. Evaluate costs to ensure that they are in accordance with the allocated budget	0	6	17	21	11	3	58	3.67	HI
3. Keep track schedule of activities to determine the progress of system development and achieve systems implementation on the deadline	0	6	17	19	14	2	58	3.73	HI
4. Monitor performance of the personnel involved in system development	2	7	15	16	15	3	58	3.64	HI
5. Record completed tasks by development team members	1	7	17	19	11	3	58	3.58	HI
6. Develop status report to determine the progress of system development	0	8	17	17	13	3	58	3.64	HI
7. Review and validate reports to ensure correctness and accuracy	1	6	16	20	13	2	58	3.68	HI
8. Evaluate delivered I.T. infrastructures before acceptance	0	10	17	14	15	2	58	3.61	HI
9. Disseminate results of monitoring and evaluation	0	9	17	18	12	2	58	3.59	HI
Grand Mean								3.66	HI

Legend:

4.51 – 5.00	Fully Implemented	(FI)
3.51 – 4.50	Highly Implemented	(HI)
2.51 – 3.50	Moderately Implemented	(MI)
1.51 – 2.50	Slightly Implemented	(SI)
1.00 – 1.50	Not Implemented	(NI)

Based on the interview, there were monitoring and evaluation strategies observed by some HEIs that opted for in-house development. For instance, one HEI uses timetable where the accomplished activities are checked against the targets. The timetable is also the basis of the release of the overtime pay (in a weekly basis) for the members of the in-house team. The overtime pay of each member of the in-house team could be claimed upon submission of the progress report containing the accomplishments based from the timetable. The report of the monitoring and evaluation is directly submitted to the President. Some HEIs did not have a regular monitoring and evaluation scheme, thus they would only rely on observations or act upon occurrence of problems.

Table 12 shows the summary of management strategies utilized by HEIs for in-house development of information system projects.

As depicted in the above table, all management strategies are highly implemented. Among these strategies, directing has earned the highest weighted mean of 3.71, while planning has earned the lowest weighted mean of 3.64. The result implies that in in-house development, directing is well performed because it is in this area where all the preparations and technical activities are executed. However, directing needs to be strengthened to achieve a complete implementation. On the other hand, planning strategy requires more enforcement, thus sufficient knowledge in planning for in-house development is suggested. In general, the grand mean of 3.67 conveys that the management strategies in in-house development of information systems are well employed but need more enforcement.

Table 12

Summary of Management Strategies Utilized by Higher Education Institutions for In-House Development of Information System Projects

Management Strategies	Mean	Interpretation
Planning	3.64	HI
Organizing	3.70	HI
Directing	3.71	HI
Controlling	3.69	HI
Monitoring and Evaluation	3.66	HI
OVERALL	**3.67**	**HI**

Legend:

4.51 – 5.00	Fully Implemented	(FI)
3.51 – 4.50	Highly Implemented	(HI)
2.51 – 3.50	Moderately Implemented	(MI)
1.51 – 2.50	Slightly Implemented	(SI)
1.00 – 1.50	Not Implemented	(NI)

Table 13 illustrates the management strategies utilized by HEIs for outsourcing of information system in terms of planning.

The results show that four indicators are moderately implemented only: conduct background investigation of the service provider, develop criteria in the selection of service providers, define performance metrics for the service provider, and establish contract termination with weighted mean 3.49, 3.38, 3.50, and 3.39, respectively; all the rests are highly implemented. Among the highly implemented indicators, the assessment of current systems has earned the highest weighted mean of 4.21. The result implies that assessing the systems in planning for outsourcing should be completely performed because this may cause potential

Table 13

Management Strategies Utilized by Higher Education Institutions for Outsourcing of Information System Projects in terms of Planning

Indicators	Ratings							Mean	Interpretation
	1	2	3	4	5	No Answer	Totals		
1. Assess current systems	0	4	10	12	30	1	57	4.21	HI
2. Conduct user need analysis	1	8	15	15	18	0	57	3.72	HI
3. Define the scope of the information system	2	4	18	20	13	0	57	3.67	HI
4. Conduct cost-benefit analysis	2	10	15	15	14	1	57	3.52	HI
5. Formulate Technical Working Group (TWG)	1	6	16	18	16	0	57	3.74	HI
6. Conduct background investigation of the service provider	4	8	15	13	15	2	57	3.49	MI
7. Develop criteria in the selection of service providers	5	8	16	13	13	2	57	3.38	MI
8. Allocate funds for outsourcing	3	6	17	11	19	1	57	3.66	HI
9. Establish contract	0	7	16	15	18	1	57	3.79	HI
10. Define performance metrics for the service provider	1	9	20	13	13	1	57	3.50	MI
11. Monitor processes within the term	0	7	20	16	14	0	57	3.65	HI
12. Establish contract termination	6	6	14	17	11	3	57	3.39	MI
Grand Mean								**3.63**	**HI**

Legend:

4.51 – 5.00	Fully Implemented	(FI)
3.51 – 4.50	Highly Implemented	(HI)
2.51 – 3.50	Moderately Implemented	(MI)
1.51 – 2.50	Slightly Implemented	(SI)
1.00 – 1.50	Not Implemented	(NI)

problems like contracting for an information system that does not totally address the needs of HEI. Meanwhile, the development of criteria in the selection of service providers is well implemented during planning but it needs to be fully executed in order to select the suitable service provider. HEIs should not simply rely on recommendations or simple background information examination of a service provider. However, SUCs' acquisition of a service provider goes through a formal process of selection, including bidding, as it is mandated by law. In general, the grand mean 3.63 implies that planning for outsourcing information systems need to be strengthened.

The results of the interview along planning for outsourcing of information systems revealed that HEIs made targets to develop the information system. One of these targets was to plan and consider for outsourcing of the system due to the need of immediate completion of the system. As one MIS Director stated, "*In-house development was not considered due to doubts in the commitment and availability of the IT personnel who will develop the system.*" In order to fund the development of the system, the University Information System (UIS) Fee was proposed. Said UIS fee was presented to the students, parents, and eventually approved by the Board of Regents (BOR). Upon approval of the UIS Fee, invitation of software developers and providers started. Moreover, some HEIs made consultation with their IT staff, IT faculty, Cashier, Registrar, and Accounting office prior to outsourcing of the information system. After which, bidding and charges for system development were considered in the plan. HEIs also considered in planning for outsourcing that the system could be expanded in order to harmonize with the need of agencies like CHED and DBM. Along this line, the ICCT Director in one of the HEIs exemplified the implementation of the Standard Template for the Information Systems Strategic Plan (ISSP) by the Medium-term Information & Communications Technology Harmonization Initiative (MITHI) as a criterion in planning for the flexibility of the system to be outsourced. To some HEIs, planning activities are performed by the administrators only according to one respondent, hence some IT personnel, IT faculty and users had not shared any information, e.g. arrangements between HEI and the provider, in terms of planning for outsourcing. Such scenario was evident in some Private HEIs.

Table 14 illustrates the management strategies utilized by HEIs for outsourcing of information system in terms of organizing.

The data displayed in the table depict that all the indicators along organizing are highly implemented. In these indicators, to finalize the contract has earned the highest weighted mean of 3.87, while to gather benchmark information about the service provider has earned the lowest weighted mean 3.57. The results suggest that putting the outsourcing contract in place is well employed since it is very necessary before any outsourcing IS project can be executed; however, said task should be absolutely done. On the other hand, gathering of background information about the service provider is conducted but is not constantly done. This happens because most of the time, it is the service provider that submits a project proposal eventually becomes the source of information of the HEI about the service provider. In general, the grand mean 3.68 implies that organizing requires more effort for an effective outsourcing management of information systems.

Table 14

Management Strategies Utilized by Higher Education Institutions for Outsourcing of Information System Projects in terms of Organizing

Indicators	Ratings							Mean	Interpretation
	1	2	3	4	5	No Answer	Totals		
1. Gather benchmark information about the service provider	3	7	14	19	13	1	57	3.57	HI
2. Conduct meetings with service provider	1	5	18	17	15	1	57	3.71	HI
3. Finalize the contract	0	6	14	16	19	2	57	3.87	HI
4. Assemble members of Outsourcing Team or TWG	1	8	17	17	13	1	57	3.59	HI
5. Define communication and coordination schemes	1	8	15	17	13	3	57	3.61	HI
6. Prepare technical resources, such as hardware & software	0	7	15	19	13	3	57	3.70	HI
Grand Mean								3.68	HI

Legend:

4.51 – 5.00	Fully Implemented	(FI)
3.51 – 4.50	Highly Implemented	(HI)
2.51 – 3.50	Moderately Implemented	(MI)
1.51 – 2.50	Slightly Implemented	(SI)
1.00 – 1.50	Not Implemented	(NI)

In a separate interview on organizing for outsourcing of the system, it was revealed that HEIs set time frame for the development of the system. In one HEI, The Project Monitoring Committee (PMC) was created to monitor all transactions made between HEI and the service provider. The PMC members were selected based on their technical know-how. HEIs also considered the conduct of orientation and training for the use of outsourced system. The tasks were also distributed among the members of the team involved in outsourcing. Most of the time, MIS Office is tasked to perform consultation with the service provider/software developer on problems encountered and other queries relative to system use. Request for high-end computers is also made as part of organizing information system outsourcing.

Table 15 shows the management strategies utilized by HEIs for outsourcing of information system in terms of directing.

As displayed in the table, all the indicators along directing are highly implemented. Among these indicators, the assigning of tasks to staff with knowledge and skills in outsourcing activities has earned the highest weighted mean of 3.88, while the two other strategies followed with almost similar weighted mean of 3.86. Considering these results, it suggests that the assigning of tasks to staff with knowledge and skills is applied but needs more execution. Such condition occurred due to limited staff with expertise in outsourcing activities and so only a few are assigned to perform the said task. Furthermore, the supervision of activities performed by the service provider could not be completely done because the service providers are not available all the time and would visit the HEI in a scheduled basis. Similarly, the dissemination of relevant information to concerned staff needs to be consistently conducted. Overall, the grand mean 3.87 implies that directing strategy in outsourcing needs a tighter execution.

The results of the interview along directing strategy for outsourcing support the above findings. It was revealed that the members of the PMC are designated as coordinators and are tasked to communicate with the users. Each member is directed to address the needs and problems of the module used by the specific office/user. The PMC would prepare and submit a report based on their observations on the module assigned to them. The report is presented to the service provider for action. In other HEIs, users would simply inform the MIS Office on the problems encountered and the MIS personnel would immediately act to resolve the problem.

Table 15

Management Strategies Utilized by Higher Education Institutions for Outsourcing of Information System Projects in terms of Directing

Indicators	Ratings							Mean	Interpretation
	1	2	3	4	5	No Answer	Totals		
1. Assign tasks to staff with knowledge and skills in outsourcing activities	1	5	14	17	20	0	57	3.88	HI
2. Supervise activities performed by the service provider	1	5	15	16	20	0	57	3.86	HI
3. Communicate relevant information to concerned staff	1	6	14	15	21	0	57	3.86	HI
OVERALL								3.87	HI

Legend:

4.51 – 5.00	Fully Implemented	(FI)
3.51 – 4.50	Highly Implemented	(HI)
2.51 – 3.50	Moderately Implemented	(MI)
1.51 – 2.50	Slightly Implemented	(SI)
1.00 – 1.50	Not Implemented	(NI)

Table 16 shows the management strategies utilized by HEIs for outsourcing of information system in terms of controlling.

The results showed that comparing of costs against the approved budget allocation is the only indicator rated as moderately implemented as demonstrated by its weighted mean of 3.50, all the rest are highly implemented. Among the highly implemented controlling indicators, allowing authorized personnel to have access to records and outsourcing documents has earned the highest weighted mean of 3.74. This result suggest that though the access of records and outsourcing documents are performed by authorized personnel, said strategy should be strictly done to make those records and documents tightly secured. But in some instances, other non-authorized people can have access to these records and outsourcing documents for some important reasons like audits or queries. On the other hand, comparing of costs against the approved budget allocation is moderately because the cost in outsourcing is generally fixed and is already determined prior before the development of the system takes place. In general, the grand mean 3.66 implies that controlling strategy in outsourcing needs more execution.

The interview responses revealed significant results along the controlling aspect in outsourcing. In some HEIs, controlling is done by means of checking the design of the system made by the software developer to determine if it conforms to the user requirements or need of the users. Upon conformance with the design, the PMC approves the design of the system. Other HEIs would check the activities against the existing policies on the use of the system. Moreover, one IT staff shared

Table 16

Management Strategies Utilized by Higher Education Institutions for Outsourcing of Information System Projects in terms of Controlling

Indicators	Ratings							Mean	Interpretation
	1	2	3	4	5	No Answer	Totals		
1. Compare processes and activities against the terms in the contract	1	6	14	21	14	1	57	3.73	HI
2. Compare costs against the approved budget allocation	3	7	14	23	9	1	57	3.50	MI
3. Ensure that processes and activities are performed in a timely manner	0	9	17	14	16	1	57	3.66	HI
4. Ascertain that system development activities are performed based on system requirements set	2	7	15	15	17	1	57	3.68	HI
5. Review changes in the processes and design made by the service providers	3	6	15	18	14	1	57	3.61	HI
6. Approve changes in the processes and design made by the service providers	1	8	13	17	14	4	57	3.66	HI
7. Allows authorized personnel to have access to records and outsourcing documents	0	7	17	13	17	3	57	3.74	HI
Grand Mean								3.66	HI

Legend:

4.51 – 5.00	Fully Implemented	(FI)
3.51 – 4.50	Highly Implemented	(HI)
2.51 – 3.50	Moderately Implemented	(MI)
1.51 – 2.50	Slightly Implemented	(SI)
1.00 – 1.50	Not Implemented	(NI)

his view that controlling strategy was difficult to perform due to being understaff. Similarly, reporting for problems that occurred was difficult since the concerned offices do not usually prepare written reports, they just do it verbally. The respondent further stated that it would be better if checking of the system would be done by-system or by-module – accounting, cashier, and registrar. This problem of understaff was evident in Private HEIs. Other Private HEIs have no IT or MIS office at all that would facilitate not only the controlling activity but other system-related activities. Hence, these HEIs would depend totally from their contracted software developers/software providers.

Table 17 presents the management strategies utilized by HEIs for outsourcing of information system in terms of monitoring and evaluation.

In can be observed from the table that the indicator about the conduct of on-site visits by Project Monitoring Committee (PMC) earns the lowest weighted mean of 3.39 which is moderately implemented, while all the rest are highly implemented. The conduct of on-site visit by the PMC is not totally done because the service providers are not all the time available to perform the said activity, hence there is a need to strengthen this strategy. On the other hand, the validation of completed tasks and systems components has earned the highest weighted mean of 3.75 from the group of highly implemented indicators. This suggests that validation of completed tasks and systems components is conducted but has to be exercised more. Generally, the grand mean 3.56 tells that the monitoring and evaluation strategy is conducted in outsourcing but has to be intensively done.

Table 17

Management Strategies Utilized by Higher Education Institutions for Outsourcing of Information System Projects in terms of Monitoring and Evaluation

Indicators	Ratings							Mean	Interpretation
	1	2	3	4	5	No Answer	Totals		
1. Validate completed tasks and systems components	1	8	11	21	16	0	57	3.75	HI
2. Review contract for consistency in the terms	3	6	14	21	12	1	57	3.59	HI
3. Conduct on-site visits by Project Monitoring Committee (PMC)	3	9	14	23	7	1	57	3.39	MI
4. Evaluate costs	4	7	14	17	13	2	57	3.51	HI
5. Track schedule of activities	1	10	16	14	15	1	57	3.57	HI
6. Record completion of tasks by service providers	1	9	14	19	12	2	57	3.58	HI
7. Disseminate results of monitoring and evaluation	2	9	15	12	17	2	57	3.60	HI
Grand Mean								3.56	HI

Legend:

4.51 – 5.00	Fully Implemented	(FI)
3.51 – 4.50	Highly Implemented	(HI)
2.51 – 3.50	Moderately Implemented	(MI)
1.51 – 2.50	Slightly Implemented	(SI)
1.00 – 1.50	Not Implemented	(NI)

In the interview responses, it was found out that most of the HEIs that opted for outsourcing had no established monitoring and evaluation mechanism. For instance, there was no regular or scheduled evaluation of the system and outsourcing-related activities. Also, there was no evaluation instrument used also to determine the status of outsourcing activities and the performance of the outsourced system. The problems on the performance of the outsourced system are fixed as they occur only. This was further supported with the response of one MIS Director by stating, *"We just rely on observation."* During the occurrence of the problem, HEIs would normally report to the service provider for upgrading, maintenance, and other related services. In one HEI, it is the PMC that would do hands-on testing and follow-ups to ensure that the outsourced system perform accordingly.

Table 18 presents the summary of management strategies utilized by HEIs for outsourcing of information system.

Table 18

Summary of Management Strategies Utilized by Higher Education Institutions for Outsourcing of Information System Projects

Management Strategies	Mean	Interpretation
Planning	3.63	HI
Organizing	3.68	HI
Directing	3.87	HI
Controlling	3.66	HI
Monitoring and Evaluation	3.56	HI
OVERALL	3.67	HI

Legend:

4.51 – 5.00	Fully Implemented	(FI)
3.51 – 4.50	Highly Implemented	(HI)
2.51 – 3.50	Moderately Implemented	(MI)
1.51 – 2.50	Slightly Implemented	(SI)
1.00 – 1.50	Not Implemented	(NI)

As presented in above table, all the management strategies are highly implemented. Among the management strategies, directing has earned the highest weighted mean of 3.87 while monitoring and evaluation has earned the lowest weighted mean of 3.56. The results indicate that directing strategy is given more emphasis over the other strategies since it involves a lot of activities, both technical and non-technical, which could determine the effectiveness and desired functionalities of the outsourced information systems. However, said directing strategy needs to be strictly enforced. On the other hand, the monitoring and evaluation the monitoring and evaluation in outsourcing needs a tighter application to ensure quality outcome of outsourcing. In general, the overall mean of 3.67 implies the management strategies in outsourcing of information systems are conducted well but requires a more intensive application.

Practices of outsourcing and in-house development of Information System projects of HEIs

The current practices in outsourcing and in-house development of information systems are likewise relevant area considered in this study. The practices will provide a detailed idea of what specific tools and approaches are employed in in-house development and outsourcing of information systems. For this reason, this study aimed to determine the practices of outsourcing and in-house development of Information System projects of HEIs in terms of requirements determination, implementation, documentation, assessment, cost management, and risk management.

Table 19 presents the practices of in-house development of the information systems in terms of requirements determination.

Table 19

Practices of In-House Development of Information System Projects of Higher Education Institutions in terms of Requirements Determination

Indicators	Ratings							Mean	Interpretation
	1	2	3	4	5	No Answer	Totals		
1. Involve users to participate in the design, scope, and functionality of the system to be developed	0	7	16	13	20	2	58	3.82	OP
2. Use sample forms and reports as bases in defining system requirements	0	8	14	20	14	2	58	3.71	OP
3. Use tools and methods such as interview, observation, questionnaire, and on-site visit in determining system requirements	2	10	20	9	15	2	58	3.45	SP
4. Use standard models and diagrams in systems development to better understand the requirements	1	7	22	10	16	2	58	3.59	OP
5. Ensure that the developed system is based from the established technical and non-technical requirements	1	6	18	15	16	2	58	3.70	OP
Grand Mean								**3.65**	**OP**

Legend:

4.51 – 5.00	Always Practiced	(AP)
3.51 – 4.50	Often Practiced	(OP)
2.51 – 3.50	Sometimes Practiced	(SP)
1.51 – 2.50	Rarely Practiced	(RP)
1.00 – 1.50	Not Practiced	(NP)

As depicted in the table, all the indicators of requirements determination are often practiced, except on use of tools and methods such as interview, observation, questionnaire, and on-site visit in determining system requirements which is sometimes practiced with a weighted mean of 3.45; all the rest are often practiced. Among the often practiced indicators, to involve users to participate in the design, scope, and functionality of the system to be developed has earned the highest weighted mean of 3.82.

The analysis of the above data means that taking part of the users in the development of the system is frequently practiced. This condition can be associated to issues like resistance of some concerned employees or the administrators themselves who do not want to involve other employees in systems development; hence, this needs to be practiced at all times. On the other hand, the use of standard tools and methods systems development are occasionally practiced in an in-house development due to the lack of expertise on the use of those tools and methods like interview and questionnaire; hence, earned the lowest responses. The grand mean of 3.65 implies that there is a need to consistently perform requirements determination in in-house development method.

The interview responses provided more information along requirements determination in the in-house development of information systems. It was revealed that all HEIs observe standards in the requirements determination of the system being developed. The development team would conduct interview, study sample reports, review school policies, and examine the business models. Examples of business models include determining the maximum load, prerequisites, cross-enrollment, and payment. All these activities mentioned are used as basis of determining functionalities of the system.

Table 20 presents the practices of in-house development of information systems in terms of implementation.

The figures revealed that all the indicators of implementation are often practiced. Among these practices, the installation of the developed system in the actual site was has earned the highest weighed mean of 3.84. On the other hand, to adopt conversion strategies such as parallel, direct, pilot, and phased conversion has earned the lowest weighted mean of 3.54.

The findings suggest that the implementation of the information system emphasizes more on installation in the actual site to ensure that system will work in the environment where it should operate. However, it suggests that said practice needs to be done permanently. Meanwhile, the use of conversion scheme in the implementation of the developed system earned the lowest responses and this can be due to lack of knowledge in adopting those four conversion approaches. The grand mean 3.69 implies that implementation strategy is practiced but has to be continually conducted.

Moreover, the interview responses revealed that the implementation of the system in in-house development is normally facilitated by a group of IT Faculty. The developed system is installed in the actual site and is tested with actual data. A system documentation is prepared and a post-deployment support such as maintenance and enhancement is performed. For one HEI, the members of the

Table 20

Practices of In-House Development of Information System Projects of Higher Education Institutions in terms of Implementation

Indicators	Ratings							Mean	Interpretation
	1	2	3	4	5	No Answer	Totals		
1. Develop deployment plan for the new system	1	5	16	21	10	5	58	3.64	OP
2. Prepare the required resources in the implementation such as hardware and software	0	8	14	16	18	2	58	3.79	OP
3. Install the developed system in the actual site	0	8	15	11	22	2	58	3.84	OP
4. Test the installed system with actual data	0	10	14	12	20	2	58	3.75	OP
5. Adopt conversion strategies such as parallel, direct, pilot, and phased conversion	1	10	17	15	14	1	58	3.54	OP
6. Prepare complete documentation of the developed system	0	8	15	20	13	2	58	3.68	OP
7. Conduct training on the use of the new system	2	8	19	11	17	1	58	3.58	OP
8. Provide post-deployment support such as maintenance and enhancement	0	13	12	17	15	1	58	3.60	OP
Grand Mean								**3.69**	**OP**

Legend:

4.51 – 5.00	Always Practiced	(AP)
3.51 – 4.50	Often Practiced	(OP)
2.51 – 3.50	Sometimes Practiced	(SP)
1.51 – 2.50	Rarely Practiced	(RP)
1.00 – 1.50	Not Practiced	(NP)

development team of HEIs would do the coding/programming. One HEI shared that coding and installation are done by-system/by-module. A one-time training on how to use the system is conducted to the users and it is done by-office. When technical problems occur, assigned technicians who are experts in networking, hardware, and software are called. The in-house developed system also maintains logs that contained records of changes/revisions in the program. The information system is also equipped with a back-up system and system utilities. The system utilities cater to special cases like withdrawal of subjects and changing of loads. However, it is ensured that user requests are approved and in accordance with school policies. For smaller HEIs where mostly are private schools, information systems developed by the students as their thesis or project are normally allowed for implementation. These HEIs would just purchase new set of computer, and other devices like barcode scanner needed for a full implementation. Such scenario exists because according to one IT staff, smaller private HEIs have insufficient budget to fund for IT projects, hence they could not afford to hire external software developers. The school administrators, as revealed by one IT faculty, are hesitant to fund for the implementation of new IS projects, much for outsourcing.

Table 21 presents the practices of in-house development of information systems in terms of documentation.

It can be gleaned from the table that all the indicators of documentation are often practiced. Specifically, the recording of every completed task of systems development has earned the highest weighted mean of 3.78, while reviewing the documentation to ensure that it conforms to the plan has earned the lowest weighted mean 3.65. The results imply that some tasks may not necessarily be

Table 21

Practices of In-House Development of Information System Projects of Higher Education Institutions in terms of Documentation

Indicators	Ratings							Mean	Interpretation
	1	2	3	4	5	No Answer	Totals		
1. Record every completed task of systems development	0	4	18	19	14	3	58	3.78	OP
2. *Record the changes in* the system requirements	1	8	13	18	15	3	58	3.69	OP
3. Develop user documentation which tells users how to use the system	0	6	19	16	14	3	58	3.69	OP
4. *Develop system* documentation which includes all of the documents describing the developed system	0	7	19	11	18	3	58	3.73	OP
5. Review the documentation to ensure that it conforms with the plan	0	6	21	14	14	3	58	3.65	OP
Grand Mean								*3.71*	*OP*

Legend:

4.51 – 5.00	Always Practiced	(AP)
3.51 – 4.50	Often Practiced	(OP)
2.51 – 3.50	Sometimes Practiced	(SP)
1.51 – 2.50	Rarely Practiced	(RP)
1.00 – 1.50	Not Practiced	(NP)

recorded, hence frequently practiced. Meanwhile, the review of documentation against the plan would mean that said practice may not be that necessary, hence earned the lowest responses. As a whole, the grand mean 3.71 denotes that documentation is practiced in an in-house development but needs to be done at all times in order to achieve quality documentation in systems development.

The interview responses further revealed the documentation practices in in-house development. For one HEI, the documentation is kept by the programmers for reference purposes. However, there was a problem revealed in giving the documentation or manual to the users. According to the MIS Head of one HEI, the users are not given the documentation since they do not usually read it, instead they prefer the on-call option for immediate action. Other HEIs have no user manual, but have the copy of the system installed in CD, as in the case of one Private HEI. Because proper documentation is not practiced, the changes and activities are verbally done.

Table 22 presents the practices of in-house development in terms of assessment.

Based on the figures presented, all the indicators along assessment are often practiced. On these indicators, performing assessment activity according to the guidelines and criteria has earned the highest weighted mean of 3.68, while disseminate the results of the assessment to concerned individuals has earned the lowest weighted mean of 3.53. The results suggest that the conduct of assessment using guidelines and criteria is viewed as an important activity; however, said strategy requires a continuous action. This case happens because some HEIs may not have standard guidelines and criteria that can be used for assessment. Meanwhile, the dissemination of assessment results earned the lowest responses due to the frequency in the conduct of assessment. Overall, the grand mean 3.62

suggests that the assessment in in-house development has to be constantly conducted.

Table 22

Practices of In-House Development of Information System Projects of Higher Education Institutions in terms of Assessment

Indicators	Ratings							Mean	Interpretation
	1	2	3	4	5	No Answer	Totals		
1. Conduct assessment of the processes observed in system development	2	6	15	21	13	1	58	3.65	OP
2. Perform assessment activity according to the guidelines and criteria	1	5	19	18	14	1	58	3.68	OP
3. Assess important concerns of systems development such as cost, time, security, and risk	1	8	18	16	14	1	58	3.60	OP
4. Prepare a report of the assessment	1	6	18	17	14	2	58	3.66	OP
5. Disseminate the results of the assessment to concerned individuals	2	10	16	14	15	1	58	3.53	OP
6. Conduct immediate action on assessment results	1	9	16	14	17	1	58	3.65	OP
Grand Mean								**3.62**	**OP**

Legend:

4.51 – 5.00	Always Practiced	(AP)
3.51 – 4.50	Often Practiced	(OP)
2.51 – 3.50	Sometimes Practiced	(SP)
1.51 – 2.50	Rarely Practiced	(RP)
1.00 – 1.50	Not Practiced	(NP)

The interview findings showed that in in-house development, most of the HEIs do not regularly practice assessment procedures. One MIS Head shared his view that that they do not regularly conduct assessment since they have not experienced any technical problem with the performance of the developed system. The problems that they encountered were not that too serious since most of them are user-related problems only like errors in data entry. They practiced real-time response to the problem. Another MIS staff from other HEI mentioned that the conduct of assessment is "as the need arises" only. Except for one HEI that conduct assessment on the status of the developed system before start of classes, before midterm and after the semester and perform immediate action on the results of the assessment.

Table 23 shows the practices of in-house development of information systems in terms of cost management.

As depicted in the table, all the indicators of cost management are often practiced, except on allocate the overall cost estimate to individual work items to establish baseline for measuring performance which is sometimes practiced with a weighted mean of 3.46. Among the often practiced cost management indicators, three of them earned the highest weighed mean, namely: conduct of accounting and auditing of expenditures, disseminate the results of accounting and auditing of expenditures, and keeps track of the changes in the development of the system to avoid additional cost, all with similar weighted means of 3.63. The results imply that these three cost management activities are performed since they are necessary but need to be permanently conducted. Having earned the lowest responses, there is a need to put emphasis more on the allocation of overall cost estimate to

Table 23

Practices of In-House Development of Information System Projects of Higher Education Institutions in terms of Cost Management

Indicators	Ratings							Mean	Interpretation
	1	2	3	4	5	No Answer	Totals		
1. Develop approximation or estimate of the costs of the resources needed to develop the system	0	6	19	20	10	3	58	3.62	OP
2. Allocate the overall cost estimate to individual work items to establish baseline for measuring performance	0	9	20	19	8	2	58	3.46	SP
3. Record every expenditure that occurs	1	6	23	17	10	1	58	3.51	OP
4. Conduct accounting and auditing of expenditures	1	5	19	21	11	1	58	3.63	OP
5. Disseminate the results of accounting and auditing of expenditures	0	8	18	18	13	1	58	3.63	OP
6. Compare the actual cost with the allocated budget for system development	1	8	18	18	12	1	58	3.56	OP
7. Keeps track of the changes in the development of the system to avoid additional cost	0	9	18	14	15	2	58	3.63	OP
8. Gather baseline information about prices of I.T. infrastructures needed in system development	1	10	11	21	12	3	58	3.60	OP
Grand Mean								**3.58**	**OP**

Legend:

4.51 – 5.00	Always Practiced	(AP)
3.51 – 4.50	Often Practiced	(OP)
2.51 – 3.50	Sometimes Practiced	(SP)
1.51 – 2.50	Rarely Practiced	(RP)
1.00 – 1.50	Not Practiced	(NP)

individual work items in order to establish baseline for measuring performance in terms of cost. As a whole, the grand mean 3.58 implies that cost management in in-house development is directed but needs to be executed all the time to achieve a reliable cost in information system acquisition.

Based from the interview, it was found out that some HEIs practiced cost management procedures. In one HEI, all requests for the needed equipment in the development and maintenance of the system are submitted to the Office of the President. The development team ensures that the equipment to be purchased are cost-effective. For instance, the MIS Director exemplified that instead of acquiring individuals CPUs, a thin-client is used with only one central server but connected to terminals. This set-up, according to the MIS Director, makes the system easy to maintain and produces a longer life-span and eventually saves a lot in terms of cost. For another HEI, determining the cost is based on request. For every two years, the budget is allocated for the upgrading of the system which would include upgrading of the server and other of infrastructures like the Local Area Network (LAN). Other private HEIs practiced cost management but not as effective or established as the SUC HEIs.

Table 24 depicts the practices of in-house development of information systems in terms of risk management.

It can be gleaned from the table that all the indicators along risk managements are often practiced. On these practices, to ensure that only authorized personnel perform systems development activities earned the highest

Table 24

Practices of In-House Development of Information System Projects of Higher Education Institutions in terms of Risk Management

Indicators	Ratings							Mean	Interpretation
	1	2	3	4	5	No Answer	Totals		
1. Identify potential risks that may cause delay *to systems* development	0	6	17	18	16	1	58	3.77	OP
2. Perform risk analysis and assessment	1	6	17	18	15	1	58	3.70	OP
3. Perform monitoring of *systems development* activities to avoid potential risks	1	7	17	15	16	2	58	3.68	OP
4. Ensure that *only* authorized personnel perform systems development activities	0	6	17	16	18	1	58	3.81	OP
5. Evaluate the delivered I.T. infrastructures by vendors and suppliers	1	8	19	11	18	1	58	3.65	OP
6. Provide sufficient security mechanisms on the use of the system	1	9	16	13	18	1	58	3.67	OP
7. *Review frequently* the processes in systems development to anticipate potential risk	1	8	13	19	16	1	58	3.72	OP
Grand Mean								3.71	OP

Legend:

4.51 – 5.00	Always Practiced	(AP)
3.51 – 4.50	Often Practiced	(OP)
2.51 – 3.50	Sometimes Practiced	(SP)
1.51 – 2.50	Rarely Practiced	(RP)
1.00 – 1.50	Not Practiced	(NP)

weighed mean of 3.81. On the other hand, to evaluate the delivered I.T. infrastructures by vendors and suppliers earned the lowest weighted mean of 3.65. The results indicate that though the activities related to systems development are executed by authorized personnel, there is still a need to impose said task at all times. There can be instances where HEIs allow the conduct of activities be performed by non-experts or not authorized and this will bring risk to the system. Meanwhile, the evaluation of the delivered I.T. infrastructures by vendors and suppliers earned the lowest responses because some of the in-house developed systems are not complex systems that require additional equipment; these systems simply use existing computer units and other hardware devices. The grand mean 3.71 implies that risk management in in-house development is frequently practiced and requires a consistent action to avoid potential risks.

The interview responses revealed that the HEIs that opted for in-house development practiced risk management; there were security mechanisms practiced. HEIs with in-house developed system would ensure that anybody connected to the network is authorized and recognized. For instance, the MIS Director of one HEI articulated that users need to request permission before they could access the system through the network, particularly on the use of personal laptops. It is ensured that only authorized school computers are used in information processing or copying of programs using the user accounts. Moreover, all programs are disabled from the MIS office whenever there are revisions to the programs or new versions of the program are made.

Table 25 summarizes the practices of in-house development of information systems.

The findings showed that all the practices are often practiced. Among the practices, documentation and risk management has earned the highest weighted

Table 25

Summary of Practices of In-House Development of Information System Projects of Higher Education Institutions

Practices	Mean	Interpretation
Requirements Determination	3.65	OP
Implementation	3.69	OP
Documentation	3.71	OP
Assessment	3.62	OP
Cost Management	3.58	OP
Risk Management	3.71	OP
Grand Mean	**3.64**	**OP**

Legend:

4.51 – 5.00	Always Practiced	(AP)
3.51 – 4.50	Often Practiced	(OP)
2.51 – 3.50	Sometimes Practiced	(SP)
1.51 – 2.50	Rarely Practiced	(RP)
1.00 – 1.50	Not Practiced	(NP)

mean of 3.71, while cost management has earned the lowest weighted mean of 3.58. The results imply that recording of related activities in in-house development is conducted but not continually done, hence problems on records and documents may likely to occur more. Moreover, the result on risk management not extensively practiced supports the findings of Mushi & Bakari (2012: 4) that management of risk in in-house information systems become a problem due to ineffective information system security, no background and enough experience in information systems security by professionals employed, and no idea by the management on how the attainment of organizations' strategic objective can be affected by possible risks posed by the system. Therefore, these could be the reasons why HEIs frequently perform risk management. On the other hand, cost management earned the lowest weighted mean due to the reason that the cost in in-house development could not be easily determined. In some HEIs, particularly the Private HEIs, cost management is done by the administration alone, not involving the employees. The grand mean 3.64 implies that all the practices employed in in-house development need consistent execution in order to achieve effective in-house development.

Table 26 presents the practices of outsourcing of information systems in terms of requirements determination.

As shown in the table, all the indicators along requirements determination are often practiced. Among these indicators, providing the service providers with sample forms and reports used by HEIs as bases in defining system requirements has earned the highest weighted mean of 3.84, while recording every change made by the service provider in the system requirements has earned the lowest weighted mean of 3.61. The results imply that the use of sample forms and reports are done because it is considered an effective technique in determining the requirements of the system to be developed; it provides the service providers a clearer picture of how business processes in HEIs are performed and what data are required in those processes. However, such practice of requirements determination needs to consistently done. As a whole, the grand mean 3.67 implies that requirements determination has to be permanently performed. Doing it permanently can produce an information system that really fits and addresses the needs of HEIs.

The interview responses further provided insights on requirements determination in outsourcing. For HEIs that opted for outsourcing, requirements determination are practiced according to standards. For instance, consultation

Table 26

Practices of Outsourcing of Information System Projects of Higher Education Institutions in terms of Requirements Determination

Indicators	Ratings							Mean	Interpretation
	1	2	3	4	5	No Answer	Totals		
1. Allow users to participate in determining system requirements	3	6	13	19	16	0	57	3.68	OP
2. Provide service providers with sample forms and reports used by HEIs as bases in defining system requirements	2	5	13	16	20	1	57	3.84	OP
3. Allow service providers to use tools such as interview, observation, questionnaire, and on-site visit in determining system requirements	1	8	13	21	12	2	57	3.64	OP
4. Record every changes made by the service provider in the system requirements	2	8	16	14	16	1	57	3.61	OP
OVERALL								3.67	OP

Legend:

4.51 – 5.00	Always Practiced	(AP)
3.51 – 4.50	Often Practiced	(OP)
2.51 – 3.50	Sometimes Practiced	(SP)
1.51 – 2.50	Rarely Practiced	(RP)
1.00 – 1.50	Not Practiced	(NP)

with users based on their needs are conducted by the service provider together with outsourcing in-charge of HEI. The provider would gather data and information by examining current forms and reports used by HEIs such as enrollment forms, vouchers, receipts, subject loads, reports for CHED, and others. The software developer would design the new forms and reports based from the needs of end-users. Moreover, the expected outputs are set in order to achieve the expected functionality of the system.

Table 27 displays the practices of outsourcing of information systems in terms of implementation.

As depicted in the table, all the indicators of implementation are often practiced. On these indicators, requiring the service provider to install the developed system in the actual site has earned the highest weighted mean of 4.02, while to require service provider to conduct training on the use of the new system earned the lowest weighted mean of 3.77. The analysis of the results indicates that installation of the system in the real environment by the service provider is done to ensure that it will work when deployed in the actual environment; however, said task has to be accomplished permanently. Meanwhile, requiring service provider to conduct training on the use of the new system earns the lowest response because in some HEIs the local counterparts, like the MIS or IT personnel, are the ones who implement the training and orientation on the use of the new system. The grand mean 3.82 implies that all of the implementation activities in outsourcing needs constant execution.

Based from the interview conducted along implementation of information system outsourcing, most of the HEIs practiced the direct implementation approach. This means that the operation of the old systems was stopped completely and the new outsourced system was put immediately into use. The

Table 27

Practices of Outsourcing of Information System Projects of Higher Education Institutions in terms of Implementation

Indicators	Ratings							Mean	Interpretation
	1	2	3	4	5	No Answer	Totals		
1. Require service provider to install the developed system in the actual site	1	4	13	12	25	2	57	4.02	OP
2. Require service provider to test the installed system with actual data	2	6	14	11	24	0	57	3.86	OP
3. Require service provider to conduct training on the use of the new system	3	6	14	12	22	0	57	3.77	OP
4. Require service provider for user documentation and system documentation	1	8	12	16	20	0	57	3.81	OP
5. Require service provider for post-development support such as system maintenance and consultation as indicated in the contract	2	5	15	14	19	2	57	3.78	OP
Grand Mean								3.82	OP

Legend:

4.51 – 5.00	Always Practiced	(AP)
3.51 – 4.50	Often Practiced	(OP)
2.51 – 3.50	Sometimes Practiced	(SP)
1.51 – 2.50	Rarely Practiced	(RP)
1.00 – 1.50	Not Practiced	(NP)

outsourced system was installed and tested to ensure that its modules/components performed properly. Along installation and testing activities, one HEI conducted mock enrollment to compare the manual process to the computerized one through the newly developed outsourced system. It was also intended to determine the functionalities of the new system, for example to determine if it successfully generate subject listing and assessment. Upon completion of the system, a user orientation was conducted by the service and provided a manual. In cases that software developer is not on-site, HEI's IT personnel that served as the local counterpart of the service provider would do the installation but with the guidance of the developer/provider. The IT personnel would make a call to the provider after installation for queries. In upgrading the system, the provider would deploy personnel to HEI to do the upgrading. The HEI would also ensure that the warranty for the software product would be strictly observed by the provider. On support to operation, it was shared by the ICTC Director of one HEI that a technical support is provided by the provider during the first two years as indicated in the contract. The service provider would come to check the system free of charges, but provided with free lodging by the HEI. Hence, the post-implementation services is observed in information system outsourcing.

Table 28 exhibits the practices of outsourcing of information systems in terms of documentation.

The table exposes that all the indicators along documentation are often practiced. On these indicators, requiring user documentation which tells users how to use the system emerged has earned the highest weighted mean of 3.76. In

Table 28

Practices of Outsourcing of Information System Projects of Higher Education Institutions in terms of Documentation

Indicators	Ratings							Mean	Interpretation
	1	2	3	4	5	No Answer	Totals		
1. Record all outsourcing-related processes for audit purposes	1	7	17	16	14	2	57	3.64	OP
2. Record every completed task of systems development	1	6	13	22	13	2	57	3.73	OP
3. Record the changes made by the service provider in the design of the system	2	7	13	17	16	2	57	3.69	OP
4. Record contract problems and issues	2	5	15	19	14	2	57	3.69	OP
5. Require system documentation which includes all of the documents describing the developed system	2	6	13	17	17	2	57	3.75	OP
6. Require user documentation which tells users how to use the system	3	4	15	14	19	2	57	3.76	OP
7. Review the technical document to ensure that it conforms with the contract	2	4	19	18	13	1	57	3.64	OP
Grand Mean								**3.68**	**OP**

Legend:

4.51 – 5.00	Always Practiced	(AP)
3.51 – 4.50	Often Practiced	(OP)
2.51 – 3.50	Sometimes Practiced	(SP)
1.51 – 2.50	Rarely Practiced	(RP)
1.00 – 1.50	Not Practiced	(NP)

contrast, to record all outsourcing-related processes for audit purposes and review the technical document to ensure that it conforms to the contract emerged has earned the lowest the same with weighted means of 3.64. The results indicate that service providers are required to provide a user documentation because it is usually part of the agreement. However, the requiring of a user documentation from the service providers needs to be done all the time. This result is consistent with the findings of Arshad, May-Lin, Mohamed (2007: 122) that many service providers were unable to provide complete project documentation due to absence of a specific standard defined for preparing the project documentation. Hence, the results of the present and previous studies imply that the preparation of a documentation depends completely on the service provider, including the user documentation. On the other hand, some HEIs do not constantly perform recording of all outsourcing-related processes and review of technical documents, and this can be the source of potential issues. With this, it is necessary that recording be constantly performed. Overall, the grand mean of 3.68 suggests that documentation of outsourcing related activities is conducted but is not performed all the time.

The results of the interview revealed that, documentation is practiced in outsourcing. The service provider is open to changes/revisions in the modules, and these changes/revisions are documented. The user manual is normally provided by the service provider. The manual contains the features of the system and instructions how to operate. In other HEIs, problems in the system which are reported by the users are recorded by the MIS personnel and forwarded to the provider, either by e-mail or Facebook. This happened to one of the Private HEIs.

Table 29 shows the practices of outsourcing of information systems in terms of assessment.

As shown in the table, two of the indicators are sometimes practiced, namely the use of guidelines in assessing the performance of the service provider and conduct assessment by HEI's Project Monitoring Committee (PMC) with weighted mean 3.45 and 3.43, respectively; all the rest are often practiced. Among the often practiced indicators, to consider important areas of assessment such as cost, time, security, and risk earns the highest weighted mean of 3.67. The results imply that the critical components in outsourcing of information systems are considered during assessment, but said task is frequently performed only. Moreover, the conduct of assessment by HEI's Project Monitoring Committee (PMC) has the lowest responses because only a few HEIs had an established project monitoring committees to oversee the outsourcing activities. The grand mean 3.54 implies that the assessment of information system outsourcing need to be done at all times to ensure a reliable outcome.

The interview results revealed relevant information relative to assessment in outsourcing. One HEI practiced assessment by means of conducting on on-site visits by the MIS personnel or PMC members and ask the end-users for the problems observed. The PMC submits report to the Service Provider with copy furnished to the President. Unfortunately, other HEIs have no established and formal assessment procedure. Such problem was due to the absence of MIS/IT Office to take charge such activity completely. The assessment of the system and

Table 29

Practices of Outsourcing of Information System Projects of Higher Education Institutions in terms of Assessment

Indicators	Ratings							Mean	Interpretation
	1	2	3	4	5	No Answer	Totals		
1. Assess the service provider's capability in terms of financial, technical, and human resources	1	5	19	22	8	2	57	3.56	OP
2. Conduct assessment on service provider's performance in terms of services delivery	1	7	20	16	12	1	57	3.55	OP
3. Use guidelines in assessing the performance of the service provider	2	7	20	18	9	1	57	3.45	SP
4. Conduct assessment activity in accordance with the terms and conditions indicated in the contract	2	6	18	17	12	2	57	3.56	OP
5. Conduct assessment by HEI's Project Monitoring Committee (PMC)	2	8	18	17	9	3	57	3.43	SP
6. Consider important areas of assessment such as cost, time, security, risk	2	6	17	13	17	2	57	3.67	OP
7. Disseminate results of assessment to both parties – the HEI and the service provider	2	5	15	24	9	2	57	3.60	OP
	Grand Mean							3.54	OP

Legend:

.51 – 5.00	Always Practiced	(AP)
3.51 – 4.50	Often Practiced	(OP)
2.51 – 3.50	Sometimes Practiced	(SP)
1.51 – 2.50	Rarely Practiced	(RP)
1.00 – 1.50	Not Practiced	(NP)

other outsourcing-related activities is done directly upon the occurrence of the problem. The administration and the service provider are just informed if any problem that occur.

Table 30 illustrates the practices of outsourcing of information systems in terms of cost management.

It can be gleaned from the table that all the indicators along cost management are sometimes practiced. On these indicators, conducting financial planning to determine realistic cost of outsourcing has earned the highest weighted mean of 3.43, while perform adjustments in pricing of the services as agreed by both parties has earned the lowest weighted mean of 3.33. The results indicate that HEIs ensure that the cost in outsourcing of the system is reasonable because of financial planning; however, such task of financial planning needs to be performed constantly. This result on conducting financial planning supports the findings of Smuts, Kotze, & Merwe (2010: 153) about cost escalation in information system outsourcing which may result due to poor scoping and prioritization of requirements so that one of the reasons for IS outsourcing, i.e. cost reduction, will not be achieved. On the other hand, the pricing of the services could not be easily adjusted since the cost of the IS project had already been determined and finalized prior to the start of the development and implementation. As a whole, the grand mean of 3.38 implies that cost management in outsourcing has to be consistently conducted.

Table 30

Practices of Outsourcing of Information System Projects of Higher Education Institutions in terms of Cost Management

Indicators	Ratings							Mean	Interpretation
	1	2	3	4	5	No Answer	Totals		
1. Conduct financial planning to determine realistic cost of outsourcing	4	7	17	17	11	1	57	3.43	SP
2. Determine scope and pricing of the system to be developed by the service provider	3	9	16	19	8	2	57	3.36	SP
3. Conduct cost accounting and auditing of expenditures	4	7	19	15	11	1	57	3.39	SP
4. Compare actual cost with the contracted cost of the system	5	7	15	19	10	1	57	3.39	SP
5. Keep track of the additions and revisions in the design of the system to avoid additional cost	2	10	15	21	7	2	57	3.38	SP
6. Perform adjustments in pricing of the services as agreed by both parties	4	9	14	16	9	5	57	3.33	SP
7. Review the terms and conditions of the contract to evaluate cost	4	6	19	12	11	5	57	3.38	SP
OVERALL								3.38	SP

Legend:

4.51 – 5.00	Always Practiced	(AP)
3.51 – 4.50	Often Practiced	(OP)
2.51 – 3.50	Sometimes Practiced	(SP)
1.51 – 2.50	Rarely Practiced	(RP)
1.00 – 1.50	Not Practiced	(NP)

The responses coming from interview revealed that only a few of HEIs practiced proper cost management. In one HEI, the MIS Director revealed that the initial cost of system implementation is charged to the Service Provider. However, the additional cost due to expansion and additional equipment is already charged to the University. This could mean that such arrangement is stated in the contract. However, other HEIs could not provide information on cost management since MIS personnel were not involved in the cost management activities. Such case happened in one Private HEI when one MIS personnel revealed that the arrangements in cost took place between the administrators and the Service Provider only.

Table 31 depicts the practices of outsourcing of information systems in terms of risk management.

As shown in the table, two of the indicators, namely: evaluate service provider's use of third parties or partners that would be used to support the outsourced operations and determine if the service provider provides sufficient security precautions on the use of the system, are sometimes practiced with weighted means of 3.50 and 3.46, respectively; all the rest are often practiced. For often practiced indicators, evaluate service provider's capabilities to invest in and support the required technology by HEI in terms of technical, human, and financial resources has earned the highest weighted mean of 3.65. The results denote that HEIs carefully examine the capability of the service provider to handle an IS project before it enters into a formal negotiation. However, such requires constant execution.

Table 31

Practices of Outsourcing of Information System Projects of Higher Education Institutions in terms of Risk Management

Indicators	Ratings 1	2	3	4	5	No Answer	Totals	Mean	Interpretation
1. Evaluate service provider's capabilities to invest in and support the required technology by HEI in terms technical, human, and financial resources	2	4	18	18	13	2	57	3.65	OP
2. Evaluate service provider's use of third parties or partners that would be used to support the outsourced operations	3	7	14	17	11	5	57	3.50	SP
3. Consider whether additional system components and features requested by the service provider are necessary	1	6	18	21	9	2	57	3.56	OP
4. Perform on-site visits, where necessary, to ensure that service provider operates and performs services according to the terms and conditions	1	8	19	16	11	2	57	3.51	OP
5. Determine if the service provider provides sufficient security precautions on the use of the system	2	9	16	19	10	1	57	3.46	SP
6. Review accomplishment reports prepared by the service provider to determine whether the reports are adequate and accurate	2	8	18	13	15	1	57	3.55	OP
7. Determine whether the HEI will have complete access to the system maintained by the service provider	4	5	13	21	13	1	57	3.61	OP
8. Review the terms and conditions of the contract occasionally to avoid potential risks	5	5	16	15	14	2	57	3.51	OP
OVERALL								3.53	OP

Legend:

4.51 – 5.00	Always Practiced	(AP)
3.51 – 4.50	Often Practiced	(OP)
2.51 – 3.50	Sometimes Practiced	(SP)
1.51 – 2.50	Rarely Practiced	(RP)
1.00 – 1.50	Not Practiced	(NP)

This findings on evaluation of the service provider conforms to the findings in the study of Nawi, Rahman, & Ibrahim (2012: 72-74) which revealed that working with the right vendor would ensure the quality in terms of interoperability and compatibility in an IT project. Thus, such quality can only be achieved by evaluating the service provider's capabilities. On the other hand, determining if the service provider provides sufficient security precautions on the use of the system gained the lowest responses because such safety precautions may not be necessarily required in outsourcing. In general, the grand mean of 3.53 implies that risk management in outsourcing needs to be executed all the time in order to avoid problems and threats to the system.

The results of the interview provided more information on risk management for outsourcing of information system. It showed that HEIs with outsourced system practiced risk management, though it focused more in the operation of the system or technical aspect. For instance, one HEI would conduct storage back-up, conduct off-site back-up, and check the connectivity and functionality of the system. The MIS Director of one HEI even mentioned that they checked the system's functionality prior to the acceptance of the system from the software developer or service provider. On security measures, authentication to access the system is done so that only the authorized or registered personnel can have access to the system. The users are provided with user rights also. On the part of the users, they would submit a report to the assigned IT personnel on the problems met for repair. In other HEIs, their Internet connection is disabled and devices such as USB are disabled to avoid viruses. On the other hand, one MIS staff of a Private HEI revealed that the server is not yet safe since students could use or have access to the server. This indicates of unsafe use of the system. The MIS staff further expressed that an MIS office should be established and become part of the organizational structure so that risk management can be effectively performed.

Table 32 summarizes the practices of outsourcing of information system projects.

Table 32
Summary of Practices of Outsourcing of Information System Projects of Higher Education Institutions

Practices	Mean	Interpretation
Requirements Determination	3.67	OP
Implementation	3.82	OP
Documentation	3.68	OP
Assessment	3.54	OP
Cost Management	3.38	SP
Risk Management	3.53	OP
Grand Mean	3.59	OP

Legend:

4.51 – 5.00	Always Practiced	(AP)
3.51 – 4.50	Often Practiced	(OP)
2.51 – 3.50	Sometimes Practiced	(SP)
1.51 – 2.50	Rarely Practiced	(RP)
1.00 – 1.50	Not Practiced	(NP)

As shown in the table, all practices are often practiced, except for cost management which is sometimes practiced as evidenced by its weighted mean of 3.38. Among the often practiced practices, implementation has earned the highest weighted mean of 3.82. The results indicate that HEIs practice cost management in outsourcing; however, it needs to be done at all times. Furthermore, implementation strategy is frequently performed and this requires constant execution considering that such strategy includes many tasks that are highly technical in nature which requires enormous time such as coding, installation, and testing of the new system. As a whole, the grand mean 3.59 implies that the practices associated to outsourcing of information system have to be done at all times.

Performance of in-house developed and outsourced Information Systems of HEIs

Evaluating the performance of the information system, either a product of in-house development or outsourcing, is an important scale to determine if the desired goal of acquiring the information system has been achieved. Through its findings, organizations will be able gather information and make a good decision as to what acquisition method for an information system is desirable, in-house development or outsourcing. For this reason, the study aimed to determine the performance of the in-house developed and outsourced information systems of the HEIs in Samar along the areas of functionality, reliability, usability, efficiency, and sustainability.

Figure 10 shows the performance of in-house developed and outsourced information systems of HEIs in terms of functionality with respect to access.

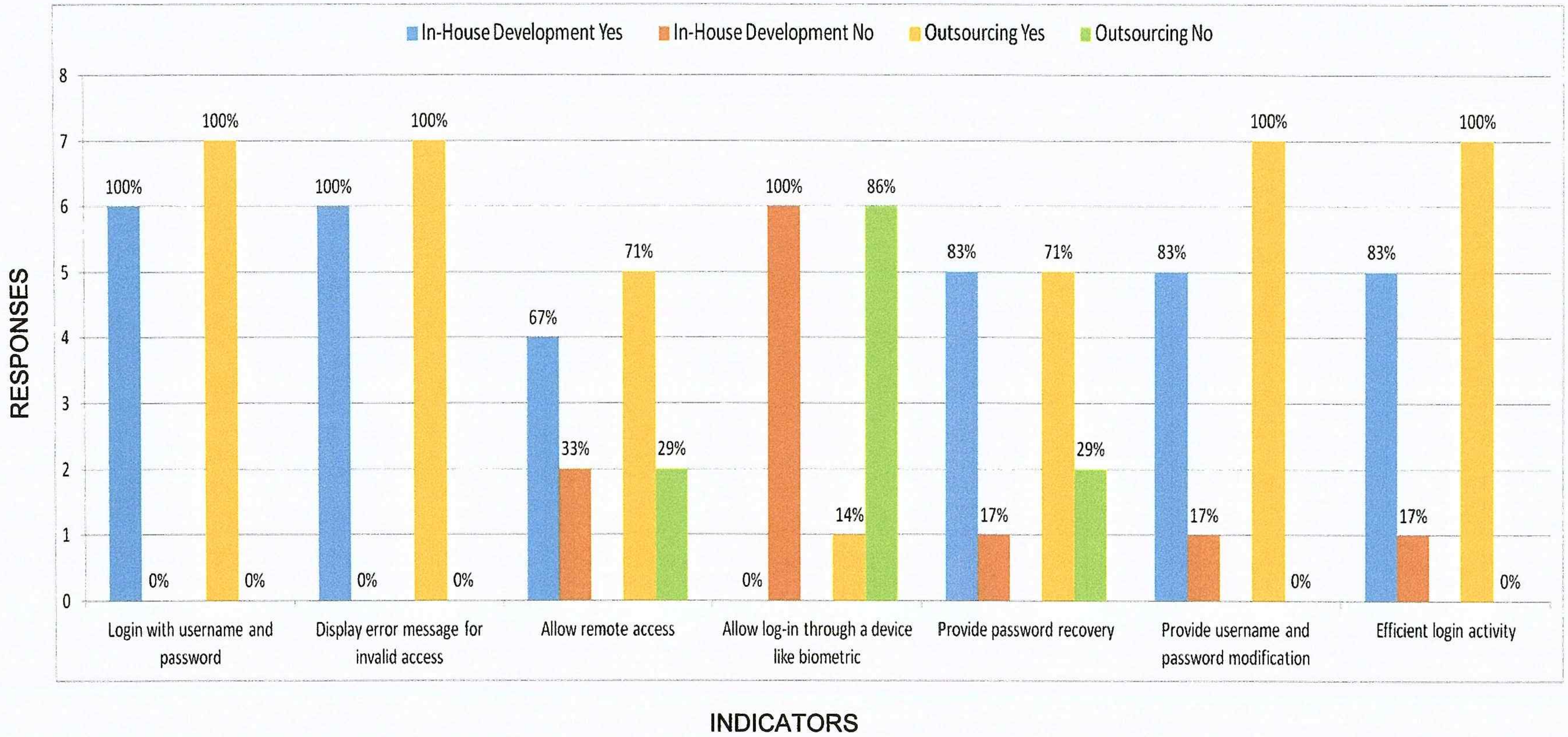


Figure 10. Performance of In-House Developed and Outsourced Information Systems of Higher Education Institutions in terms of Functionality with respect to Access

The results show that the two groups of systems completely perform log-in with username and password and can display error message for invalid access (100 percent, respectively). These indicators are totally present in the two groups of systems because these are basic functions in any information systems. On the other hand, the two groups of information systems' performance vary on the rest of the indicators. On remote access, 67 percent of the in-house developed and 71 percent of the outsourced information systems allow remote access. This shows that the two groups of systems perform almost the same with respect to remote access as evidenced by a slight difference in the result. On log-in through a device like a biometric, all or 100 percent of in-house developed systems do not allow log-in through a device, while for outsourced, only a 14 percent could not demonstrate the said functionality. The result on the use of login device implies that login device are not originally considered in the design of the in-house developed systems. As to password recovery, 83 percent of the in-house developed and 71 percent of the outsourced information systems provide password recovery mechanism. Hence, there are more in-house developed systems that can perform password recovery than the outsourced systems. Moreover, it shows that 83% of the in-house developed systems provide username and password and modification while for outsourced, there is 100 percent provision of the said functionality. Hence, username and password modification is completely present in outsourced systems than in in-house developed systems. On the efficiency of login activity, 83 percent of the in-house developed systems demonstrate an efficient login while for outsourced, there is a 100 percent efficiency. With this result, outsourced systems have better performance with respect to login efficiency.

In the physical evaluation of the systems, it was revealed that other systems allowed sharing of accounts in order to access the system. However, it was mentioned that access to the system turned into a problem during server failure. Some systems used a backdoor access when a login became an error. Other systems were designed as stand-alone system so that access to remote data cannot be made. Furthermore, the outsourced systems were efficient with respect to access. It takes only less than a minute to login and process the entered username and password.

Figure 11 illustrates the performance of in-house developed and outsourced information systems of HEIs in terms of functionality with respect to data entry and create records.

The results show that the two groups of information systems are completely functional (100 percent) with respect to the provision of input verification and control, use of efficient input methods, provide default values, display error and feedback messages for wrong entry, and display confirmation message to save records. However, the results vary on the rest of the indicators. There is a 100 percent functionality on the logical sequence of data entry for outsourced systems, while 83 percent for in-house developed systems. This indicates that outsourced systems completely demonstrate a well-organized data entry mechanism than the

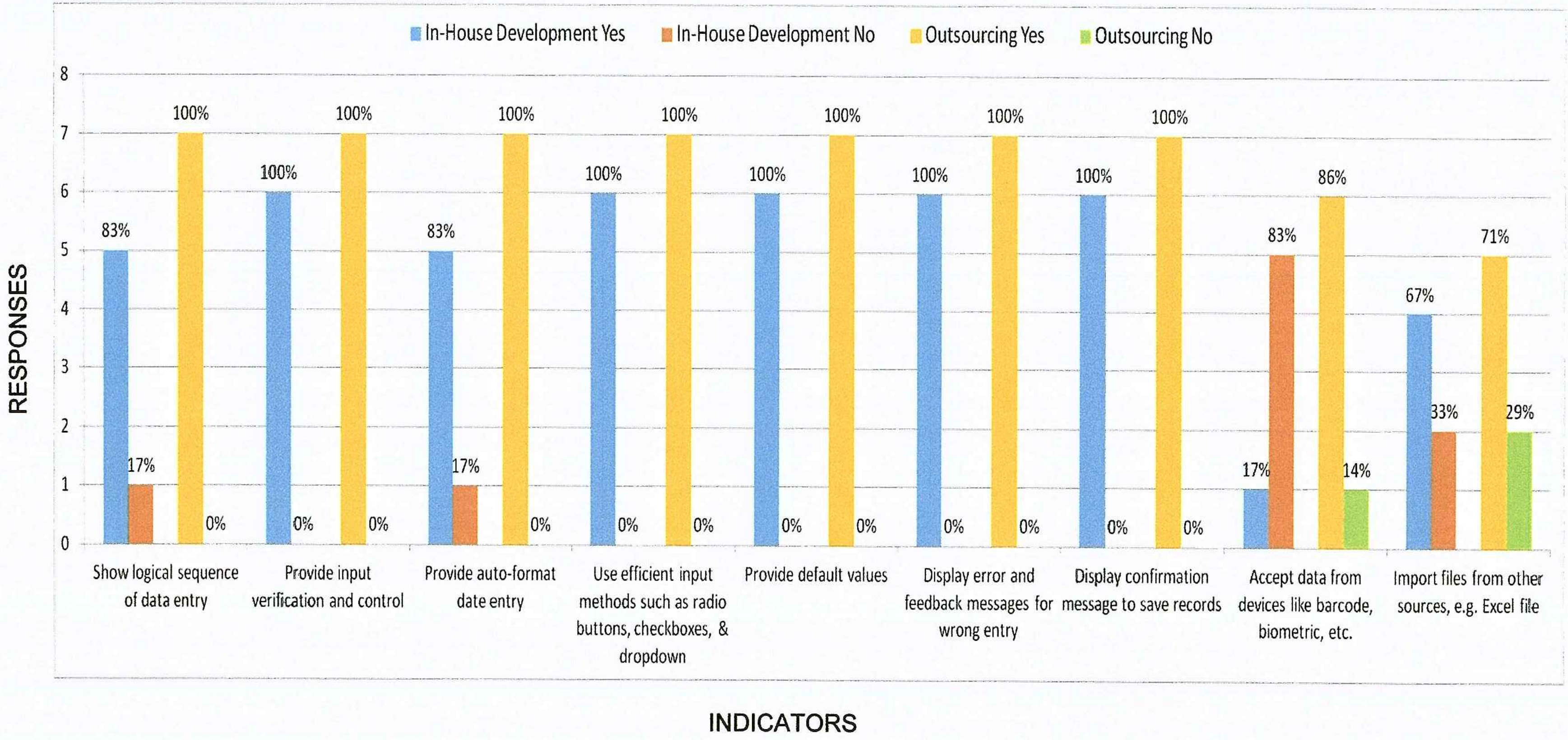


Figure 11. Performance of In-House Developed and Outsourced Information Systems of Higher Education Institutions in terms of Functionality with respect to Data Entry and Create Records

in-house developed systems. As to providing auto-format data entry, there is a 100% functionality on the auto-format data entry for outsourced systems, while 83 percent for in-house developed systems. This result implies that outsourced systems are more equipped with auto-format than the in-house developed systems. On accepting data from devices, 17 percent of the in-house developed and 86 percent of the outsourced systems accept data from devices like barcode or biometric. This indicates that there are more outsourced systems that use devices to automatically capture the data as compared to in-house developed systems. On importing files from other sources, there is a slight difference between the in-house developed and outsourced systems, with 67 and 71 percent respectively.

Figure 12 depicts the performance of in-house developed and outsourced information systems of HEIs in terms of functionality with respect to search and retrieve records.

As shown in the figure, the two groups of systems can completely (100 percent) search records with subject categories and can perform efficient search and retrieval of records. On searching of record based on a combination of subject categories within a single query, 33 percent of the in-house developed systems and 86 percent of the outsourced systems can perform such task. On this aspect, outsourced systems perform better because these can perform a single query using multiple categories. For instance, searching of student's record using name, age, and sex in one command can be done by the outsourced systems as these systems were originally designed to perform said form of query. As to display the searched

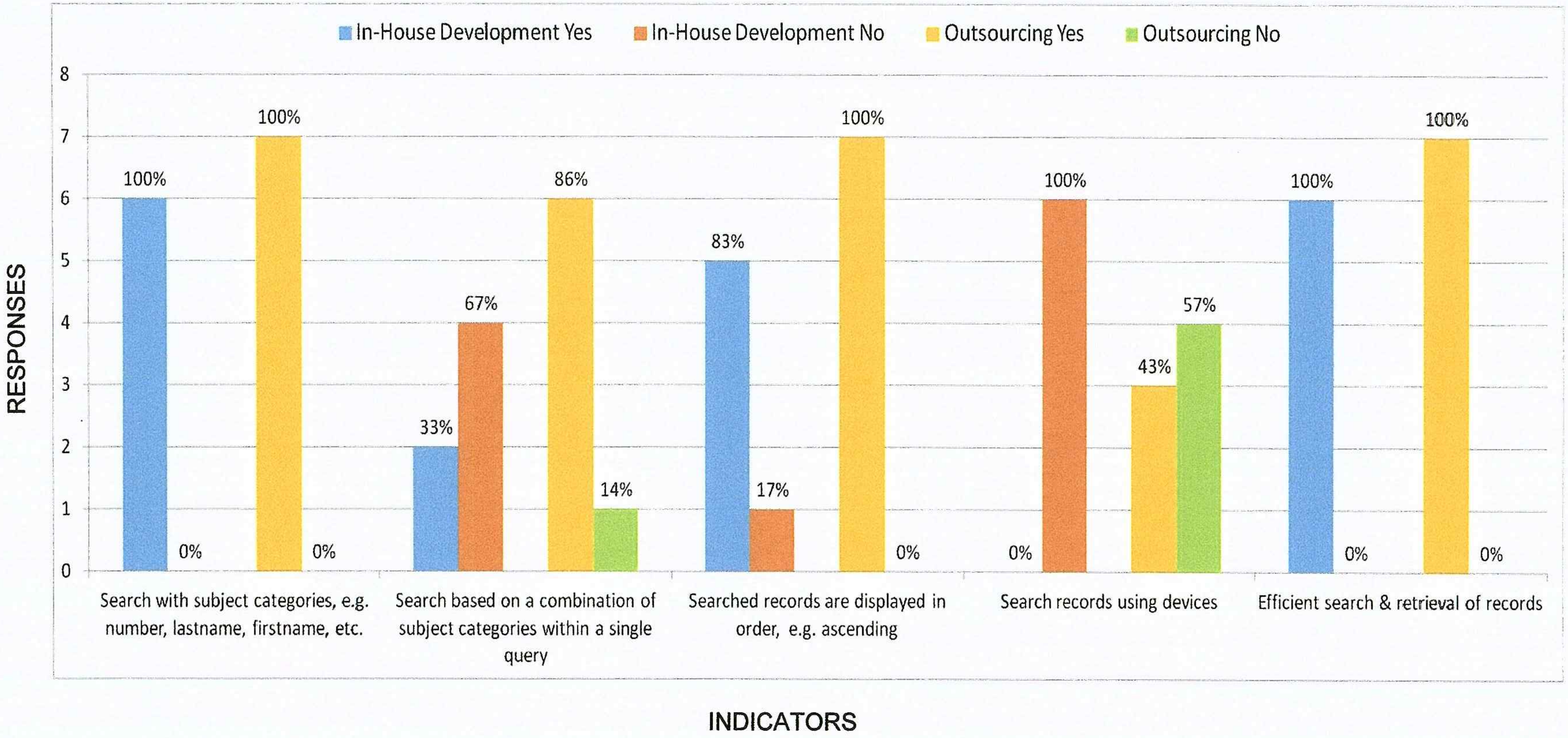


Figure 12. Performance of In-House Developed and Outsourced Information Systems of Higher Education Institutions in terms of Functionality with respect to Search and Retrieve Records

records in order, 83 percent of the in-house developed systems and 100 percent of the outsourced systems can display the searched records in order. This indicates that outsourced systems have better presentations of outputs than the in-house developed because the searched records are displayed and sorted in ascending or descending order. On searching of records using devices, none or 0 percent of the in-house developed systems while 43 percent of the outsourced systems can search records using devices. With this result, outsourced systems perform a more effective and efficient searching of records because of the use of devices.

Figure 13 shows the performance of in-house developed and outsourced information systems of HEIs in terms of functionality with respect to records processing.

The results show that the in-house developed and outsourced information systems have the same performance in performing query/search, update, delete, and report generation, generate accurate report, maintain logs for processed records, and efficient records processing having acquired 83 percent and 100 percent, respectively in each criterion. In all those criteria, the outsourced systems showed a better performance compared to in-house developed as evidenced by a 100 percent functionality. Moreover, the two groups of systems have almost the same performance on exporting of output to other file type like PDF as evidence by the slight difference in the result which is 67 and 71 percent respectively.

Based on the physical evaluation on records processing, the in-house developed systems can perform query/search, update, delete, and report

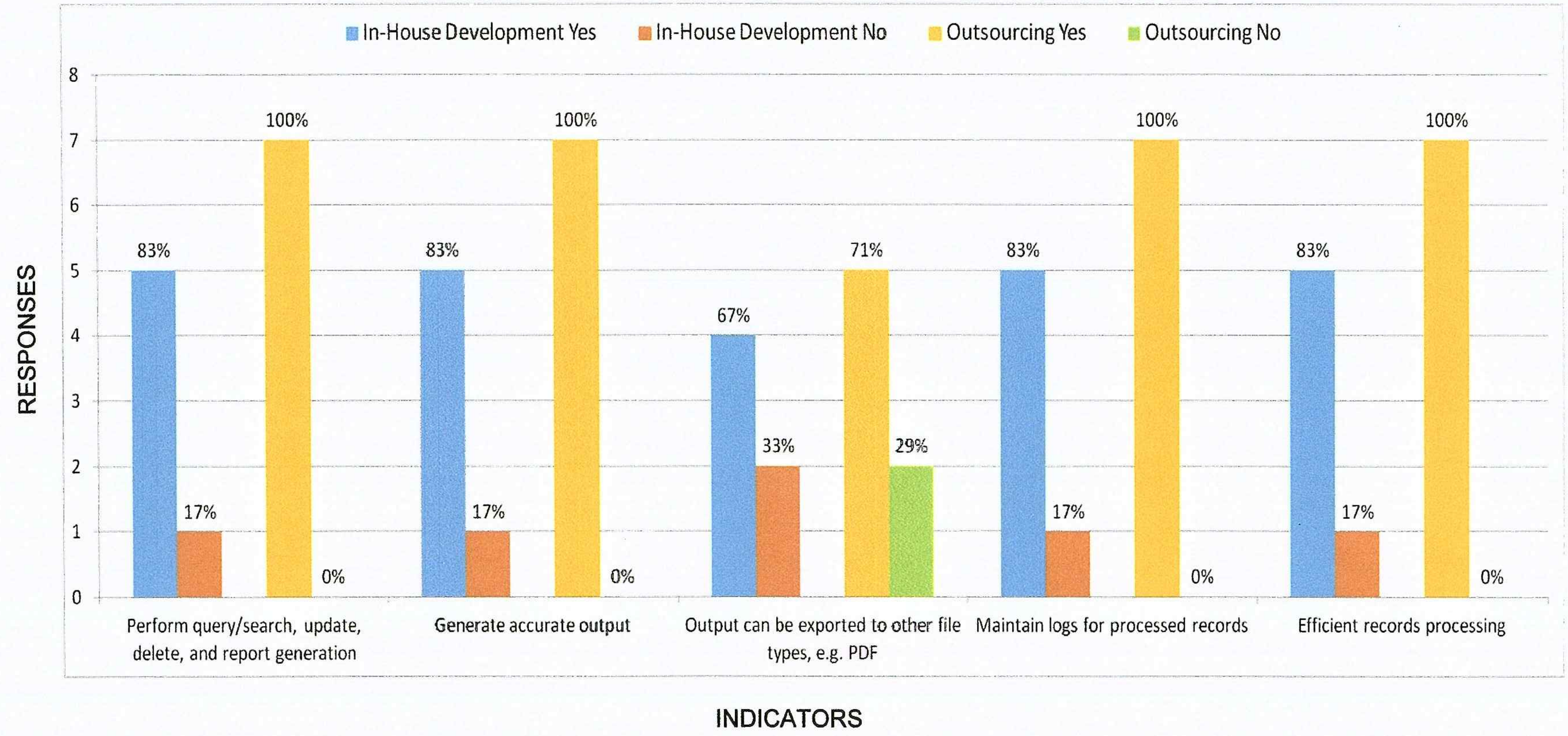


Figure 13. Performance of In-House Developed and Outsourced Information Systems of Higher Education Institutions in terms of Functionality with respect to Records Processing

generation efficiently. Some of the in-house developed systems can extract data needed in the preparation of the reports for submission to CHED, DBM, and other agencies. However, some in-house developed systems demonstrate inefficient processing by not generating a report, wrong computation of fees, and absence of logs for every transaction. Oftentimes, a back-door is done in editing/updating of records and also requires a thorough checking after editing/updating of records. On the other hand, the outsourced systems similarly process data and records efficiently which takes less than a minute only. However, the processing is affected by some problems which are normally beyond the control of the system. Along this line, the MIS Director of an SUC exemplified user factor as one of the causes of problems. He cited that users sometimes would enter misspelled data and so correcting the spelling of those data would cause a significant delay in the processing time. The outsourced systems also maintain logs for the processed records, but others maintain only the latest processed records and so previous processed records could not be seen already in the system so that problems on records processing are hardly traced.

Figure 14 shows the performance of in-house developed and outsourced information systems of HEIs in terms of functionality with respect to edit and update records.

The data show that two groups of information systems are totally or 100 percent functional in terms of display of confirmation message to edit/update and update of data when records is edited/updated. These two indicators are totally

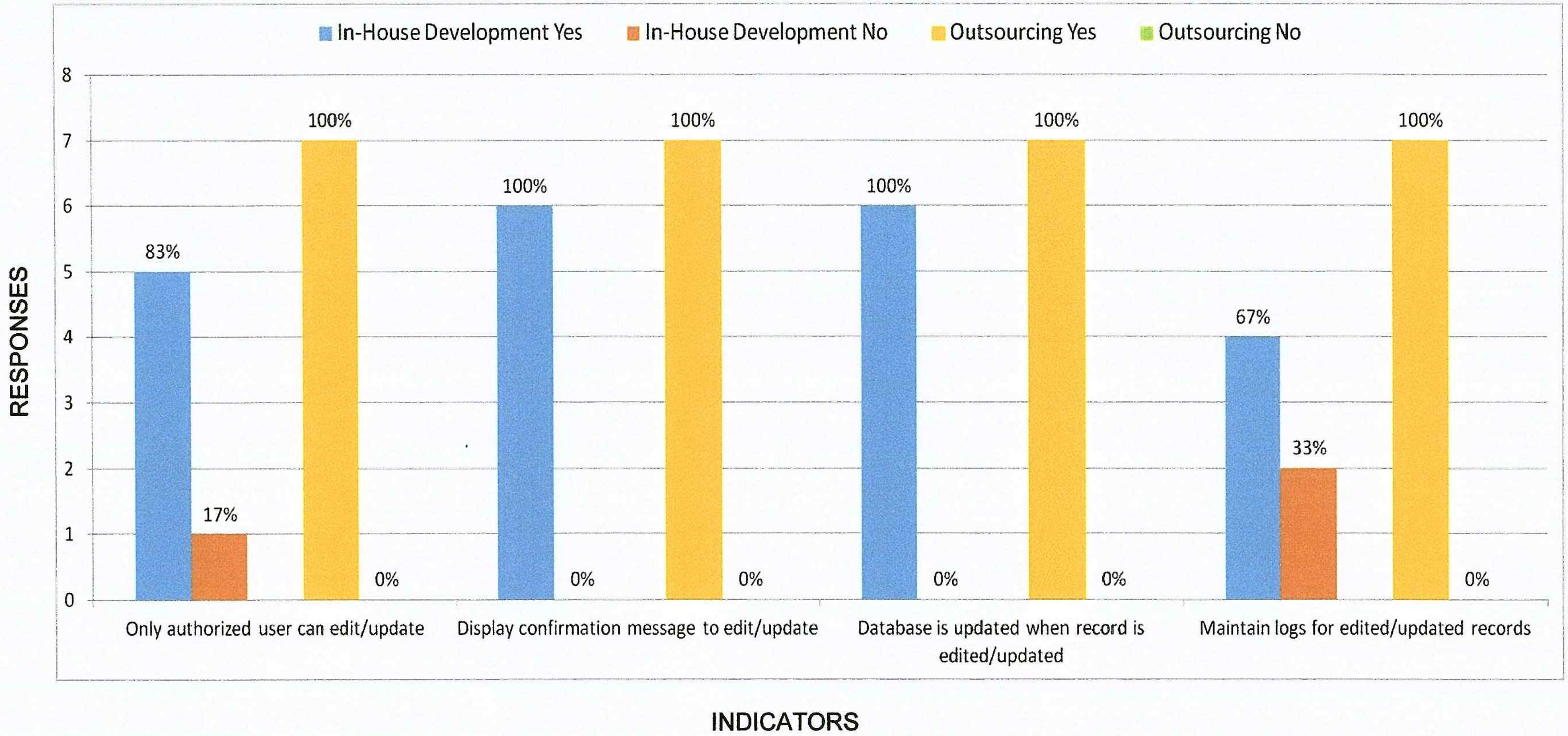


Figure 14. Performance of In-House Developed and Outsourced Information Systems of Higher Education Institutions in terms of Functionality with respect to Edit and Update Records

present because any system is expected to deliver a confirmation message every time a record is edited/updated and similarly, the database is automatically updated when changes are made on the records. Furthermore, 83 percent of the in-house developed and 100 percent of the outsourced systems allow only authorized user that can do edit/update. This means that outsourced systems are more secured than in-house developed since the records in the systems cannot be easily manipulated by any user unless authorized. As to maintain of logs for edited/updated records, 67 percent of the in-house developed and 100% of the outsourced systems maintain such logs. With this result, outsourced systems show a better mechanism in detecting the irregularities in the records than the in-house developed system because of the complete presence of the status and history of actions executed when records are edited/updated. In general, the outsourced systems have better performance than the in-house developed systems because the required indicators with respect to edit and update records are completely present and functional in those systems.

The above results were evident during physical evaluation of the systems. The evaluation revealed that that outsourced information systems maintained logs for edited/updated records. The logs would show the latest edited or updated record every update or use of the system by the user.

Figure 15 shows the performance of in-house developed and outsourced information systems of HEIs in terms of functionality with respect to delete records.

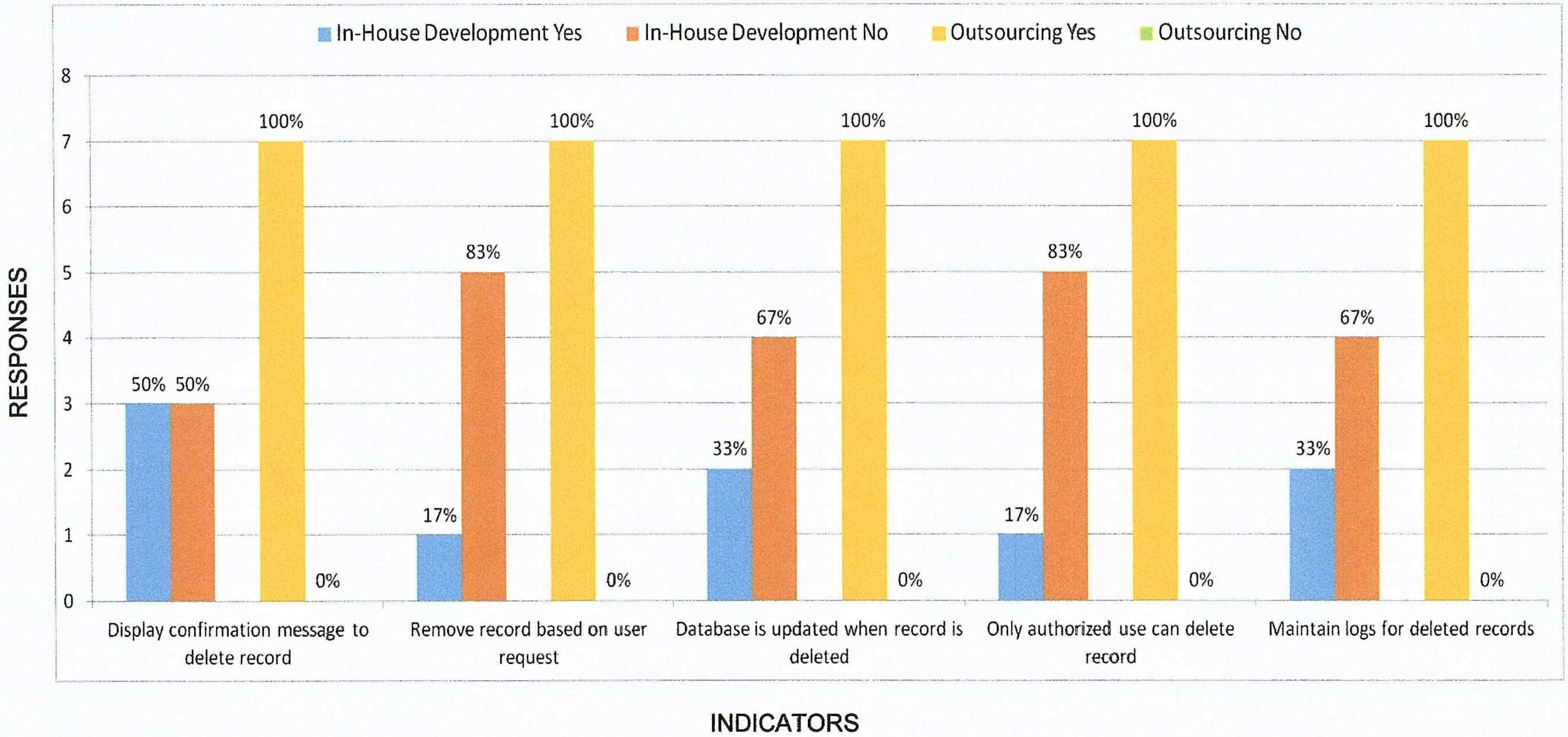


Figure 15. Performance of In-House Developed and Outsourced Information Systems of Higher Education Institutions in terms of Functionality with respect to Delete Records

The figure shows that 50 percent of the in-house developed and 100 percent of the outsourced systems display confirmation message to delete records. The data indicate that the records stored in some in-house developed systems can be potentially deleted due to absence of confirmation messages. The result further shows that the two groups of systems have the same performance in remove record based on user request and only authorized user can delete record, with 17 percent from in-house developed and 100 percent from the outsourced systems respectively. With such a big difference in the result, the outsourced systems are way flexible than in-house developed systems because they can completely accommodate the need of the user in deleting records and also show well-protected records as evidenced by authorized deletion of the records. The two groups of systems also show similar performance in update of database when record is deleted and maintain logs for deleted records, with 33 percent from in-house developed and 100% from the outsourced systems respectively. This means that most of the in-house developed systems still contain records that have been previously deleted as opposed to the outsourced systems. Also, only a few in-house developed systems also maintain history of deleted records.

As a whole, outsourced systems are more functional than in-house developed systems with respect to delete records as evidenced by the complete presence of all indicators.

The results of the observation showed that some of the in-house developed systems did not allow deleting records, instead making the records cancelled or deactivated only. The interoperability of these systems was demonstrated through the use of network infrastructures such as the WiFi and wired network. Also, other in-house developed systems did not provide user type access and so deleting of records can be done by unauthorized staff. Whereas most of the outsourced systems, most of these systems could not delete records because the records are normally not deleted for reference purposes. The non-deletion of records was demonstrated by an MIS staff by indicating "inactive" or "active" options only instead of removing the records permanently from the database. This case has been further exemplified in the case of "back out enrollees" or "transfer of school". This feature of the system is useful also in accommodating a student again after years of absence.

Figure 16 shows the performance of in-house developed and outsourced information systems of HEIs in terms of functionality with respect to report generation.

As shown in the figure, in-house developed and outsourced information systems are completely functional on print reports based on specific query (100% respectively). The results further show that the two groups of information systems have the same performance in print reports based on user need, print reports in a specified format, efficient generation of reports, and only authorized user can generate reports with 83 percent and 100 percent, respectively. On these indicators, outsourced systems perform better compared to in-house developed systems. However, the two groups of systems differ in their performance on

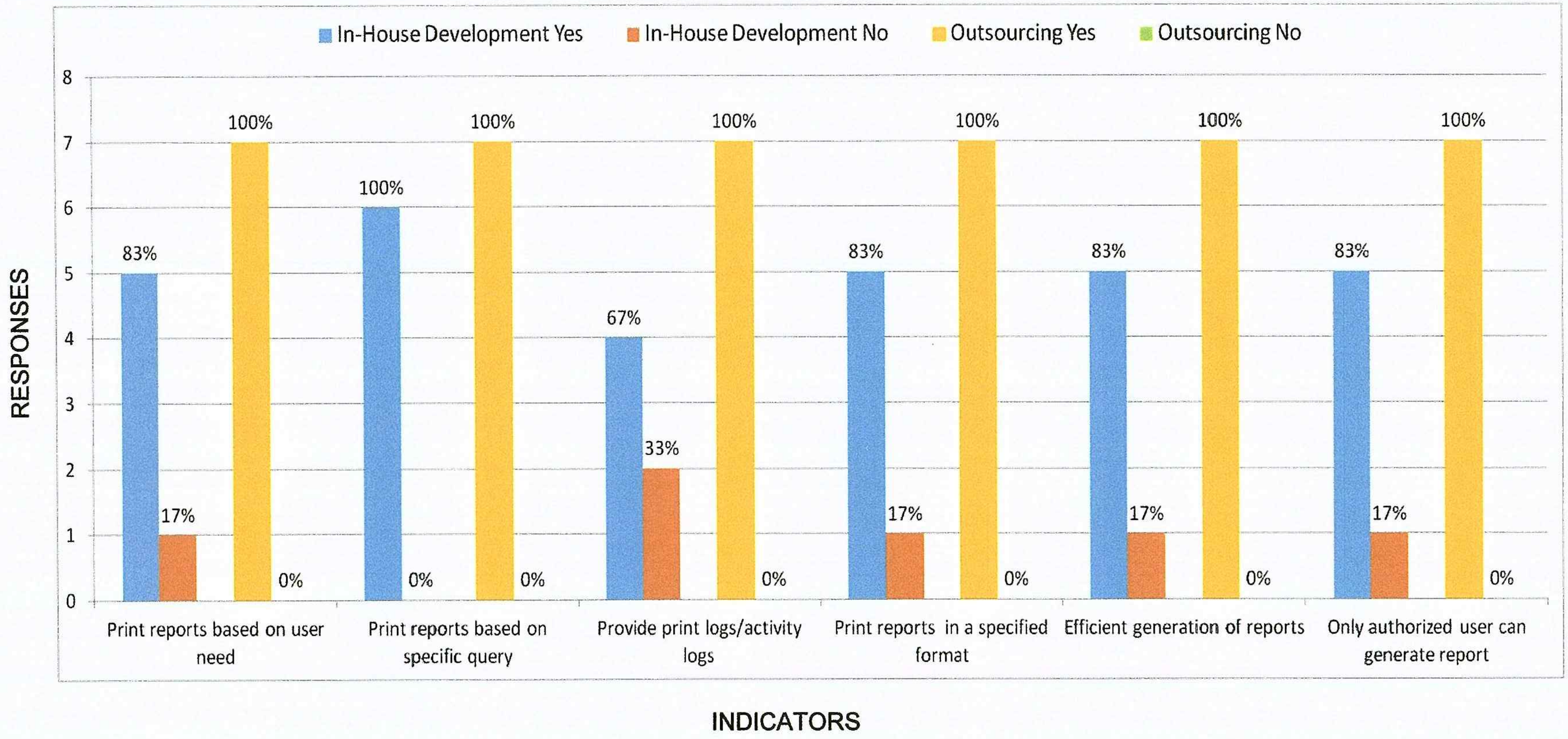


Figure 16. Performance of In-House Developed and Outsourced Information Systems of Higher Education Institutions in terms of Functionality with respect to Report Generation

provide print logs/activity logs, with 67 percent and 100 percent respectively. The result indicates that outsourced systems, as opposed to other in-house developed systems, can easily identify the status of the printed record due to the presence of print logs. Generally, outsourced system have better performance than the in-house developed systems as evidenced by the 100 percent ratings in all indicators.

Based on the physical observation, the in-house developed systems could generate and print report efficiently in less than a minute only. Some in-house developed systems could extract data for reports submission to CHED, DBM and other government agencies. Other in-house developed systems had no monitoring for each system activity. On the other hand, the outsourced systems similarly generate reports efficiently in seconds only. However other outsourced systems generate erroneous output when the data entered are incorrect. As exemplified by one staff, the printing of the Certificate of Registration (COR) could not be processed properly if the required data are not provided. This case is beyond the control of the system.

Figure 17 shows the performance of in-house developed and outsourced information systems of HEIs in terms of functionality with respect to interoperability.

The result shows that there is a slight difference between the in-house developed and outsourced system on access of remote data, with 67 and 71 percent respectively. Moreover, most of the outsourced systems can share data efficiently with 86% than the in-house developed systems with 67 percent. On reliable network connectivity, 67 percent of the in-house developed and 100 percent of the outsourced systems have reliable network connections. With this result, the outsourced systems are completely functional than in in-house developed systems.

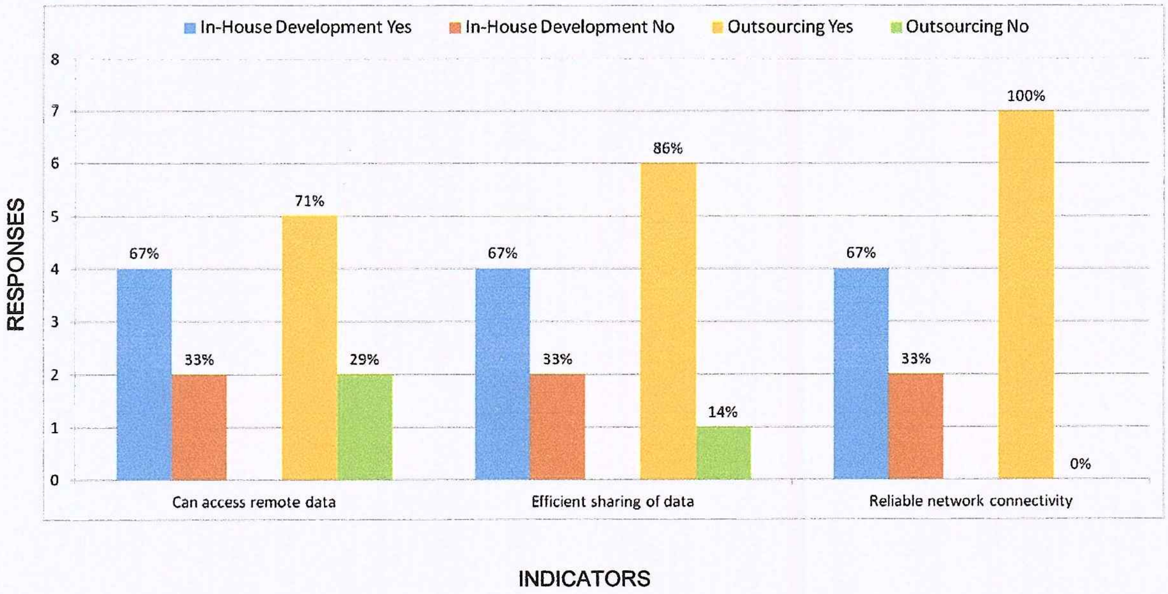


Figure 17. Performance of In-House Developed and Outsourced Information Systems of Higher Education Institutions in terms of Functionality with respect to Interoperability

Based on the observation conducted with respect to interoperability, the in-house developed systems, as mentioned by one MIS staff, fails when the server or LAN fails. Most of these systems have not experienced system crash or system failure unless the problem on LAN occurs. Other in-house developed systems performed inefficient sharing of data as evidenced by a manual storing of data in the database. As to the outsourced systems, majority of these systems demonstrated interoperability. These systems could share and access remote data efficiently. However, one MIS staff mentioned that the interoperability of the system fails when it is simultaneously used. In effect, the transmission of data from one office to another is delayed. One MIS staff also mentioned that the loss of network connectivity causes ineffective interoperability. This observation hindered access of data by the users from remote office/s.

Figure 18 shows the performance of in-house developed and outsourced information systems of HEIs in terms of functionality with respect to error prevention and control.

Based on the results, the two groups of information systems are completely (100 percent) functional on the display of warning messages and reminders. This means that any system, regardless of the mode of acquisition, is equipped always with warning messages and reminders in order to avoid occurrence of potential errors in the system. It shows further that the in-house developed and outsourced systems have similar performance on display of error messages for erroneous entries and provide confirmation message before saving with 83 and 100 percent respectively in each indicator. The result evidently show a better performance of outsourced systems on those two previously mentioned indicators. On the retry of task, 67 percent of the in-house developed and 100 percent of the outsourced systems can perform such task. The result implies that outsourced systems can totally prevent errors as these systems allow to revert the action when errors occur. On providing undo function to reverse action, none or 0 percent of the in-house

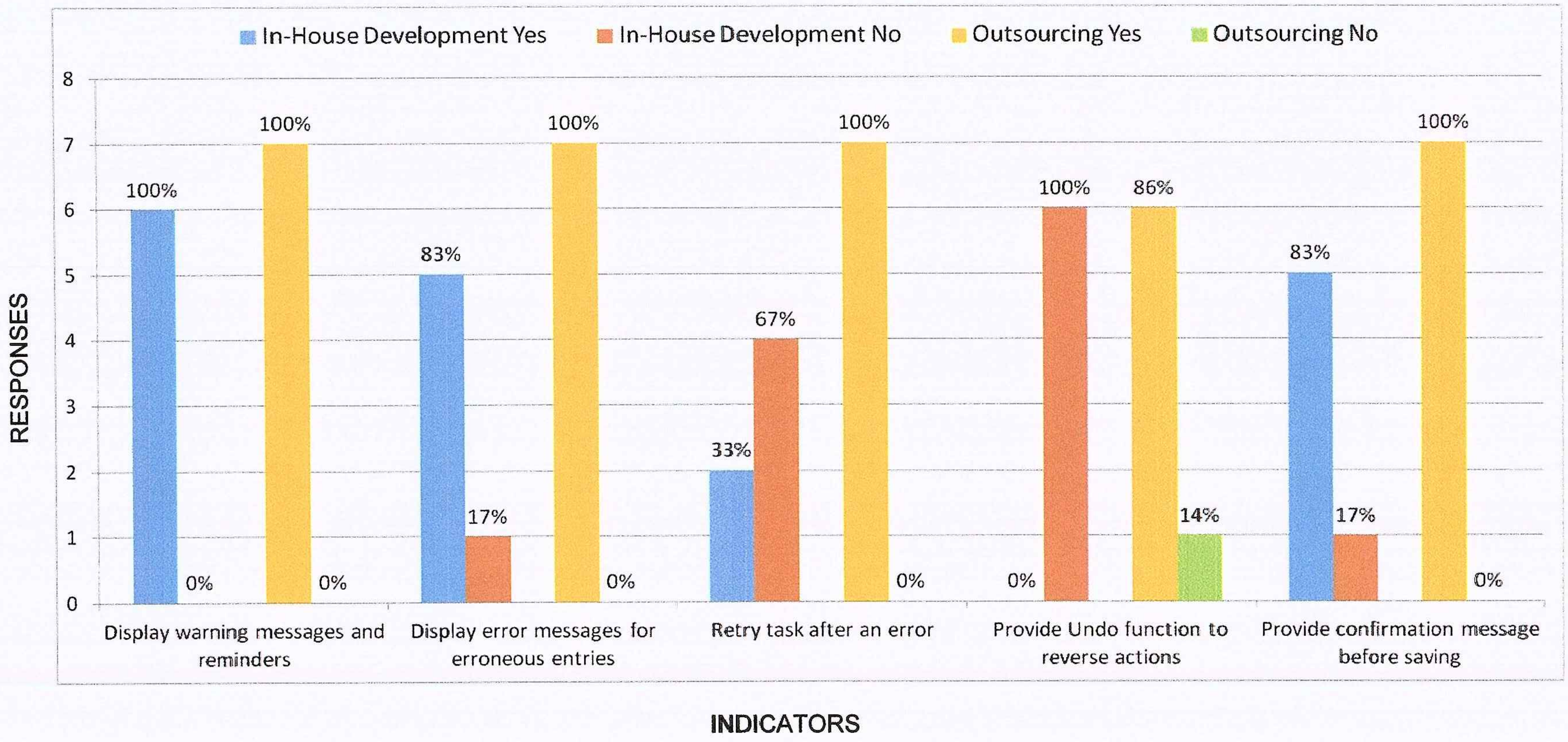


Figure 18. Performance of In-House Developed and Outsourced Information Systems of Higher Education Institutions in terms of Functionality with respect to Error Prevention and Control

developed systems can perform said task while outsourced systems can with 86 percent. The result on providing undo function means that all in-house developed do not have the mechanism to correct the wrong command or action executed by the user. Moreover, 83 percent of the in-house developed and 100 percent of the outsourced systems provide confirmation message before saving. Again, outsourced systems s how a good performance on this aspect compared to in-house developed because these systems completely ensure that all data entered are error-free before they are saved onto the database and processed by the system.

The physical evaluation with respect to error prevention and control revealed that other in-house developed systems continue to process the data due to absence of undo function that can reverse the wrong action committed by the user.

Figure 19 shows the performance of in-house developed and outsourced information systems of HEIs in terms of functionality with respect to security.

The data show that in-house developed and outsourced information systems have similar performance on assign user account and password and provide privileges to access and view records, with 83% and 100 percent respectively. On the two indicators, the outsourced systems are more secured and are unlikely to encounter illegal access, intrusion, and unauthorized modifications of data than the in-house developed systems.

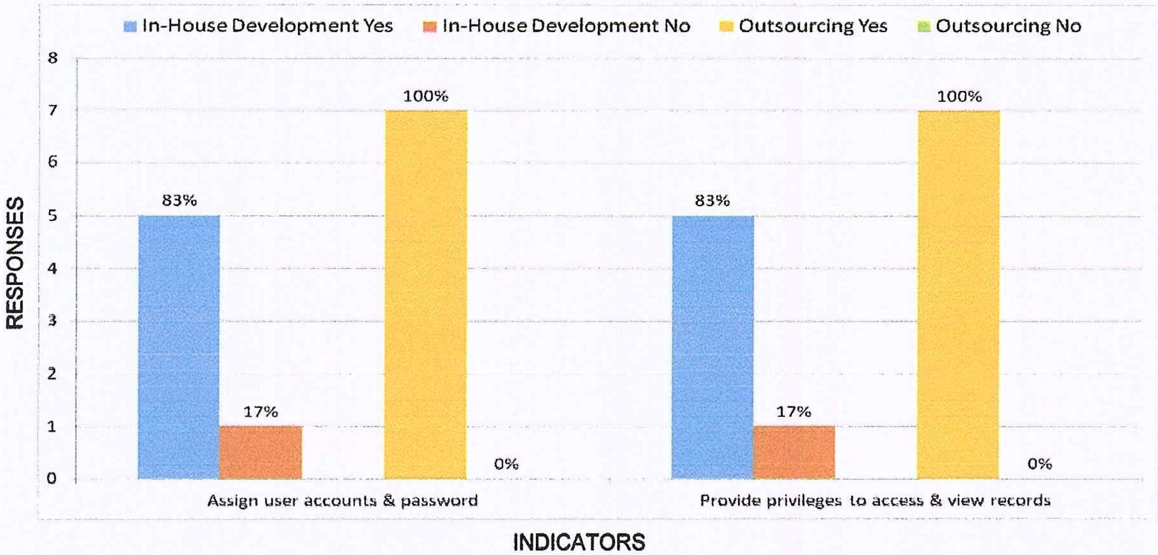


Figure 19. Performance of In-House Developed and Outsourced Information Systems of Higher Education Institutions in terms of Functionality with respect to Security

Figure 20 shows the performance of in-house developed and outsourced information systems of HEIs in terms of reliability with respect to minimal error. The data show that the in-house developed and outsourced have a slight difference in their performance on free from a frequent system error or system crash, with 83 and 86 percent respectively. This implies that majority of the systems from the two groups seldom experience system failure. However, on being free from logic error like incorrect computations, all or 100 percent of the outsourced systems are free from logic errors while only 83% of the in-house developed system can perform said indicator. With these results, outsourced systems are more dependable than the in-house developed.

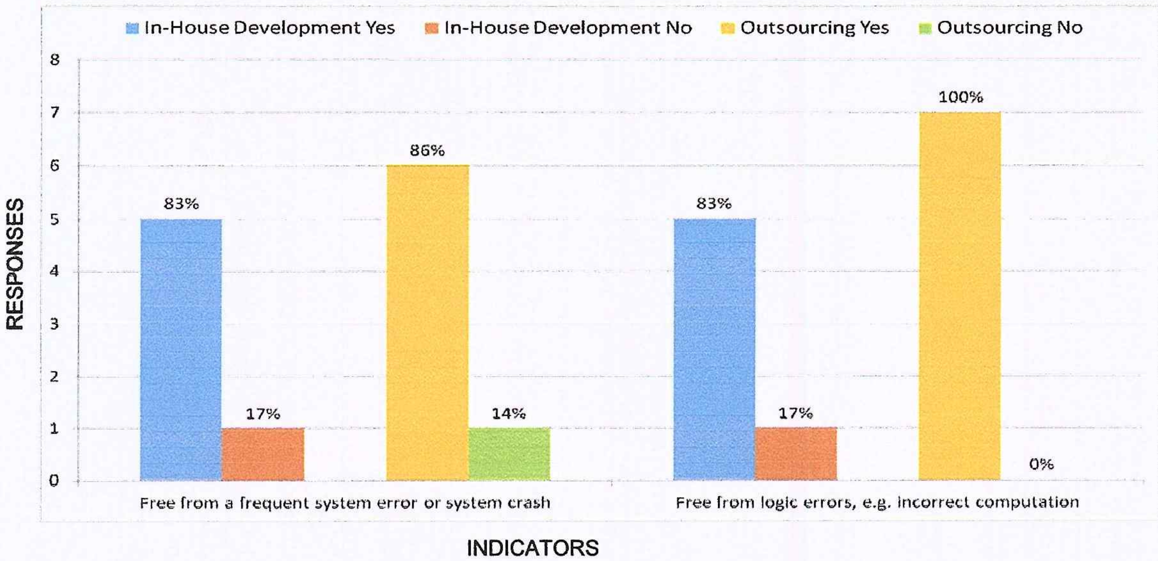


Figure 20. Performance of In-House Developed and Outsourced Information Systems of Higher Education Institutions in terms of Reliability with respect to Minimal Error

Based on the observation, it was found out that outsourced systems are not completely effective with respect to minimal error. These systems are not totally free from a frequent system error due to computer viruses. Some users upload files with viruses. In this case, the problem on reliability is associated to user factor. The accidental LAN disconnection and power failure were also cited as causes of a poor reliability. System failure, as cited by one MIS staff, occurs 2 to 3 times in a month. The MIS staff do the checking of the cause of the problems and the system recovers after a few minutes. One staff pointed out that their system would recover after reinstallation is being done. Along this line, the staff recommended for a high-end server.

Figure 21 depicts the performance of in-house developed and outsourced information systems of HEIs in terms of reliability with respect to fault tolerance.

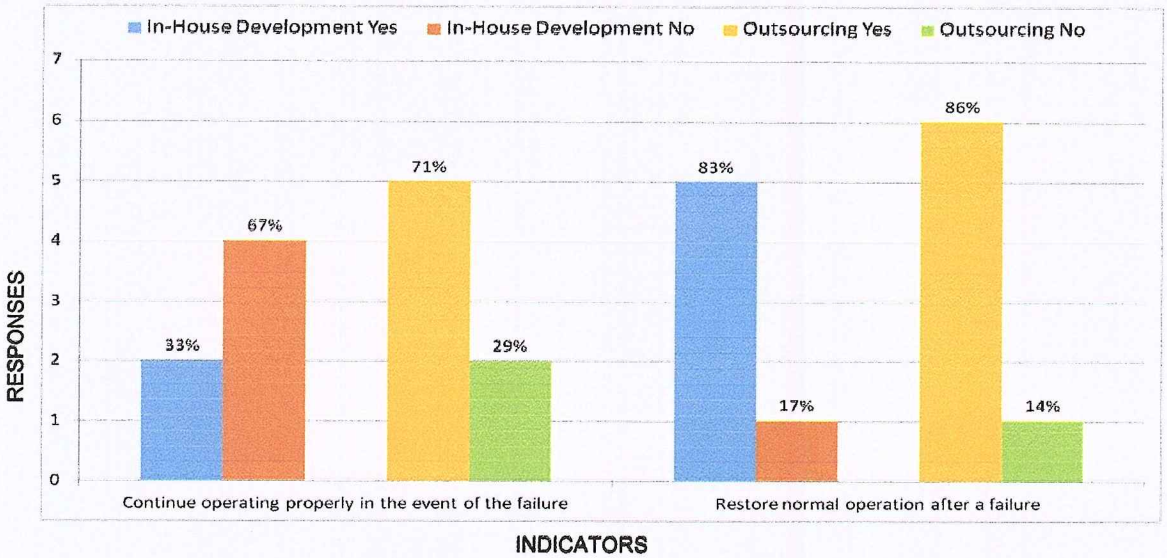


Figure 21. Performance of In-House Developed and Outsourced Information Systems of Higher Education Institutions in terms of Reliability with respect to Fault Tolerance

The result shows that there is a big difference between the in-house developed with 33 percent and outsourced information systems with 71 percent on continue operating properly in the event of the failure. This means that only a few of the in-house developed systems are capable to continue to operate amid the system failure unlike the outsourced systems. However, there is a slim difference between the groups of systems on restore normal operation after a failure with 83 and 86 percent, respectively. This indicates that most of the systems are restored immediately after problems on the systems are fixed.

Based from the observation conducted, the MIS staff of an HEI with outsourced system demonstrated fault tolerance by showing that one module is still running even other modules stopped running. Hence, outsourced systems still manage to continue to operate amid the failure.

Figure 22 depicts the performance of in-house developed and outsourced information systems of HEIs in terms of reliability with respect to backup and recovery.

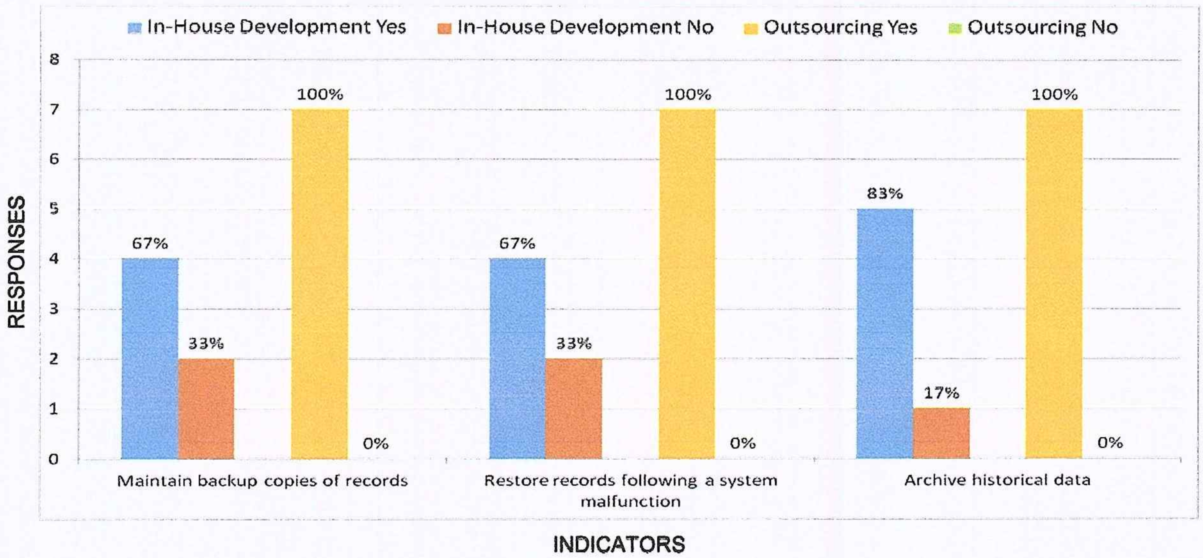


Figure 22. Performance of In-House Developed and Outsourced Information Systems of Higher Education Institutions in terms of Reliability with respect to Backup and Recovery

As shown in the figure, in-house developed and outsourced system have similar performance on maintain backup copies of records and restore records following a system malfunction with 67 and 100 percent, respectively in each of the indicator. Based from the result, the outsourced systems are more reliable with respect to the two previously mentioned indicators. On archival of historical data, 83 percent of the in-house developed and 100 percent of the outsourced systems can demonstrate said task. With this result, it can be generalized that outsourced systems completely keep old records in the database.

The results of the observation on the reliability of the systems showed that some in-house developed systems perform back-up of records. Said back-up of records is done weekly and sometimes daily, depending on the bulk of records, as cited by one MIS staff. One HEI even performs a third-party backup. However, the processing speed of the system gets slower in-case of increasing workload. Such problem on efficiency occur only during peak hours. With this problem, one MIS staff suggested the use of fiber optic to achieve efficiency in data processing.

Figure 23 illustrates the performance of in-house developed and outsourced information systems of HEIs in terms of reliability with respect to scalable.

As depicted in the figure, in-house developed and outsourced systems have almost similar performance on accommodate concurrent access to the same database by multiple users with 83 and 86 percent, respectively. This indicates that majority of the systems from both groups have well-designed databases which are intended for simultaneous of access of data. Moreover, there is a similar performance from the two groups of systems in process user request simultaneously and continue to function with increasing workload with 67 and 100 percent respectively in each of the indicator. The result indicates that outsourced systems are more scalable than the in-house developed systems along those two indicators.

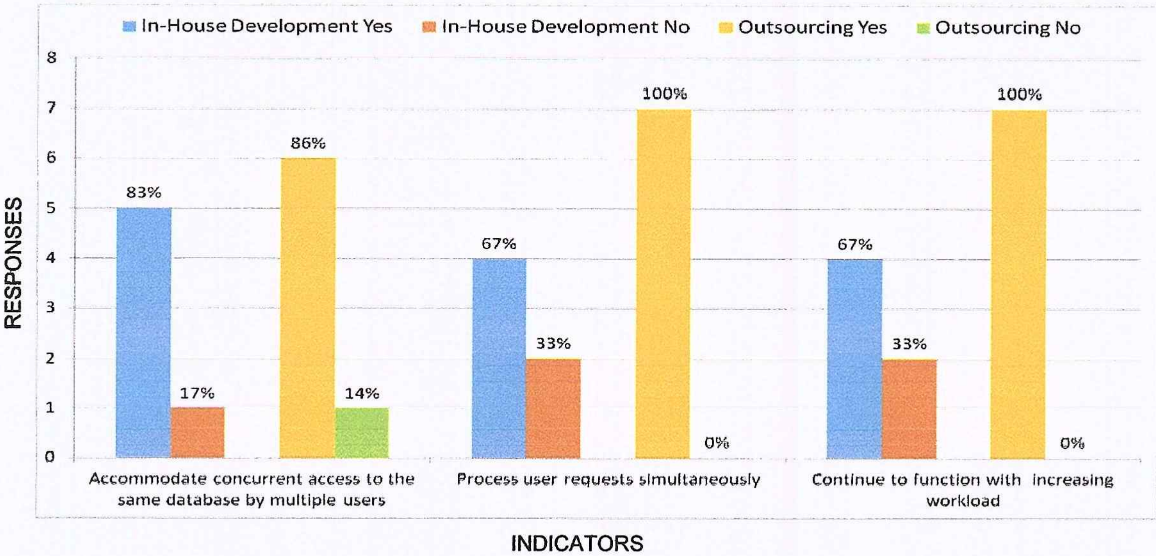


Figure 23. Performance of In-House Developed and Outsourced Information Systems of Higher Education Institutions in terms of Reliability with respect to Scalable

Based on the observation, majority of the in-house developed systems catered to a few clients only. Except for two big HEIs with in-house developed systems. The in-house developed systems are not too scalable because the systems are connected to a few offices only, usually registrar and cashier only. Hence, there is less concurrent access and user requests workload problems that occur in in-house developed systems.

Figure 24 illustrates the performance of in-house developed and outsourced information systems of HEIs in terms of usability with respect to navigation.

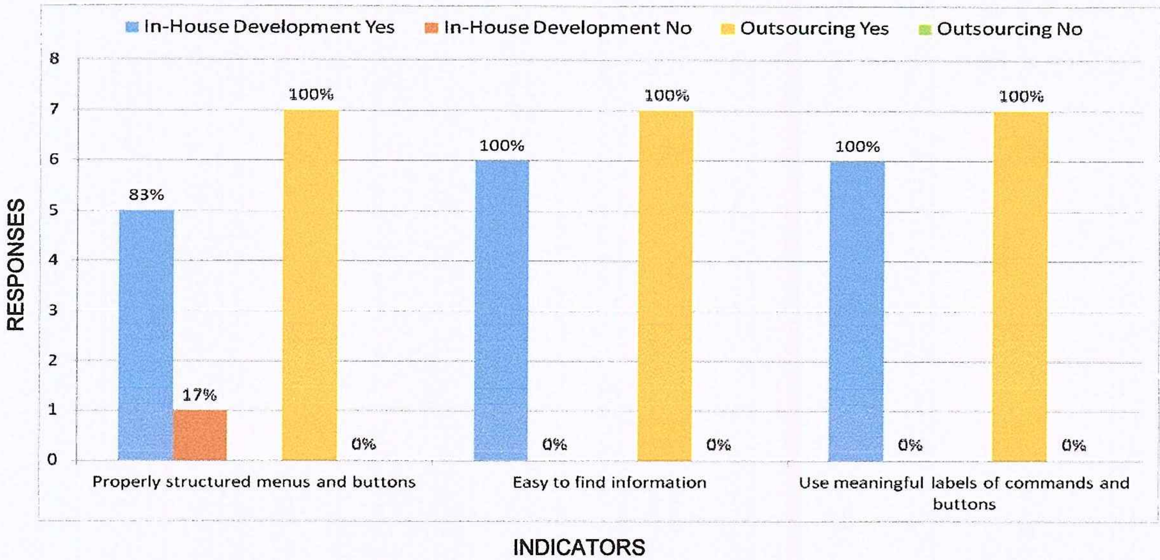


Figure 24. Performance of In-House Developed and Outsourced Information Systems of Higher Education Institutions in terms of Usability with respect to Navigation

The result shows that the two groups of information systems are totally or 100 percent find information easy and use meaningful labels of commands and buttons. However, the two groups of systems differ on properly structured menus and buttons, with 83 and 100 percent respectively. This result indicates that a few of the in-house developed systems are not user-friendly and difficult to navigate due to a poor structure of menus and buttons.

The results of the physical evaluation on navigation found out that there were outsourced systems that have buttons in the menus which are not yet used. In addition, there were duplication of buttons which showed the same functions. It was also observed that one outsourced system was too complicated to navigate because the buttons and menus are not well organized.

Figure 25 illustrates the performance of in-house developed and outsourced information systems of HEIs in terms of usability with respect to interface.

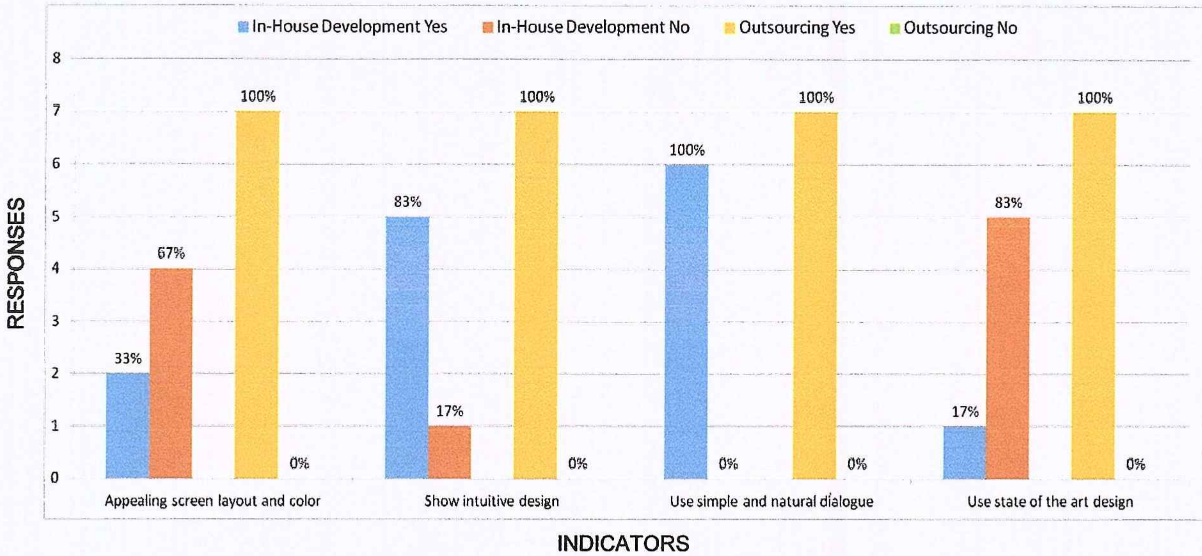


Figure 25. Performance of In-House Developed and Outsourced Information Systems of Higher Education Institutions in terms of Usability with respect to Interface

Based from the above figure, outsourced systems are completely usable with respect to interface as evidenced by a 100 percent rating in all indicators. On the other hand, the in-house developed systems have a good interface design only on the use of simple and natural languages as evidenced by a 100 percent rating but not in other indicators. This goes to show that outsourced systems have better design than the in-house developed systems on the aspect of interface and with that, the users are comfortable with and easily interact with the systems.

Based on the physical evaluation, the outsourced systems showed an organized menus and buttons. The labels of the buttons are clear and understandable with appealing color combinations of the screen layout. The sub-menus are properly grouped according to the categories.

Figure 26 displays the performance of in-house developed and outsourced information systems of HEIs in terms of usability with respect to ease of use.

The result shows that 83 percent of the in-housed developed and 57 percent of the outsourced systems require fewest steps possible to accomplish task. With this result, in-house developed systems have better performance because most of these systems are simple and not too complicated to use. On the other hand, the two groups of systems have the same performance in recover from mistakes quickly and easily, clear and understandable instructions, enable to accomplish tasks more quickly, and locate information quickly with 83 and 100 percent respectively in each of the indicator. The results indicate that outsourced systems are more usable in terms of the previously mentioned indicators. On navigation, all or 100 percent of the in-house developed systems have easy navigation features than the outsourced systems with 86 percent. On this aspect, the in-house developed systems are better than outsourced systems because these systems are simpler and not complex systems; hence, easy to navigate.

The physical evaluation on the ease of use found out that some outsourced systems were difficult to use. These systems showed redundancy of tasks. This redundancy of tasks, like searching for a record of a particular student, becomes a problem. This problem, according to an MIS staff, are felt by the new users of the system who are not familiar yet with the interface of the system.

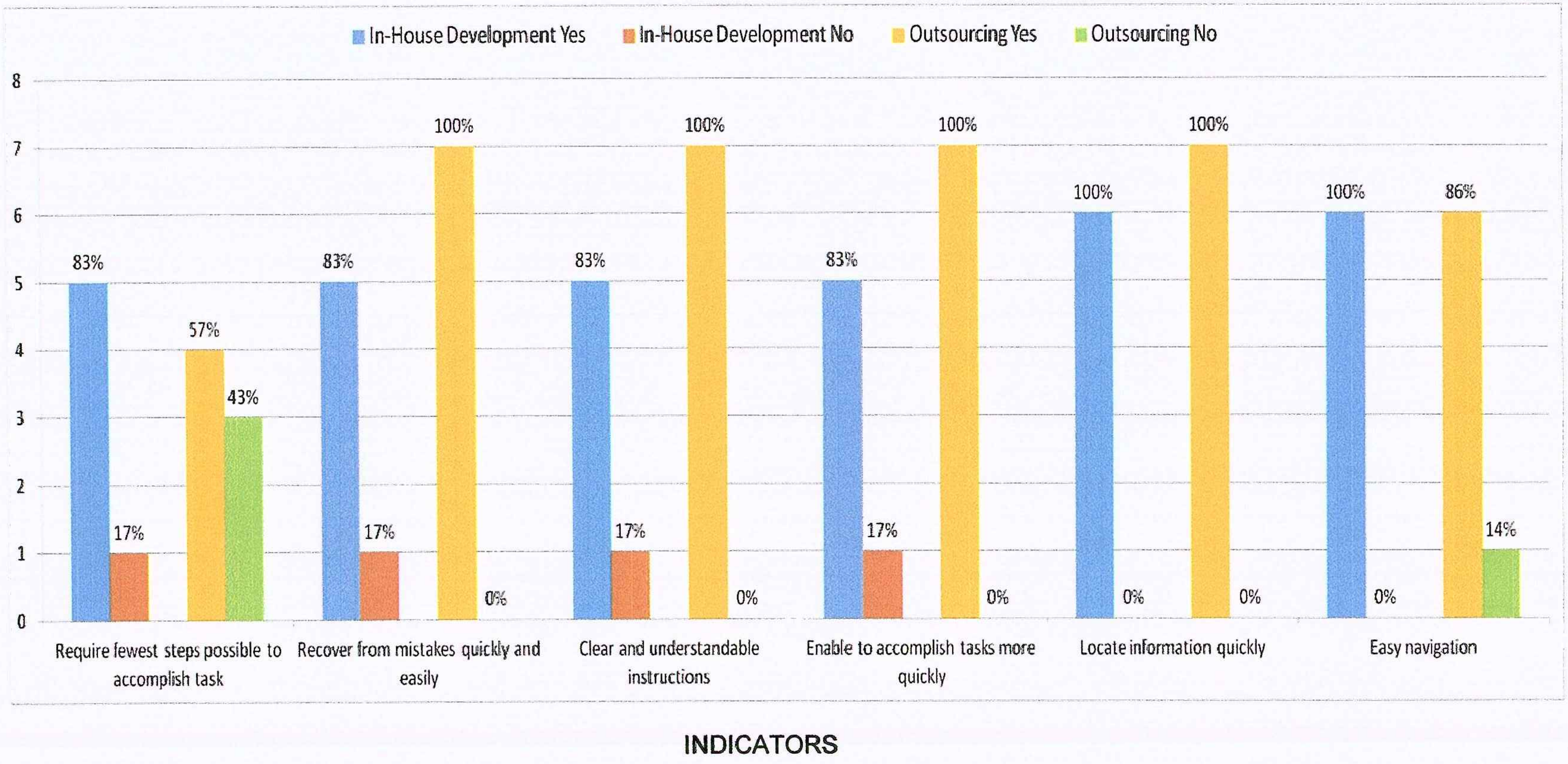


Figure 26. Performance of In-House Developed and Outsourced Information Systems of Higher Education Institutions in terms of Usability with respect to Ease of Use

In Figure 27, the performance of in-house developed and outsourced information systems of HEIs in terms of usability with respect to help mechanism is shown.

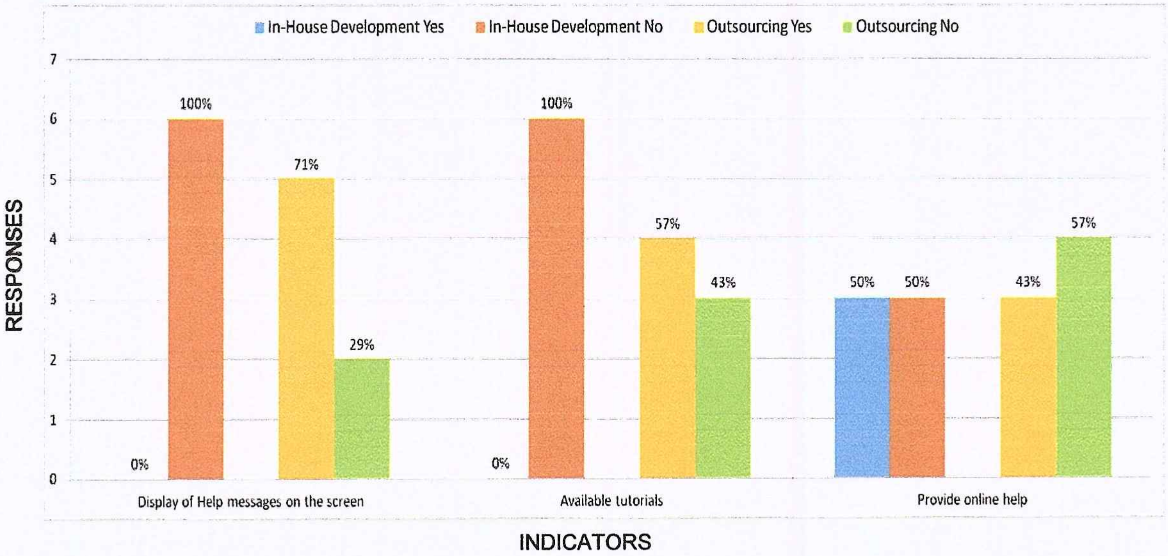


Figure 27. Performance of In-House Developed and Outsourced Information Systems of Higher Education Institutions in terms of Usability with respect to Help Mechanism

The data reveal that none or 0 percent of the in-house developed systems display help messages on the screen, while 71 percent of the outsourced systems perform said task. This implies that the users of the in-house developed systems are having difficulty to continue working with the system when an error occurs because these systems do not provide information display that can guide them throughout the use of the system. Similarly, none or 0 percent of the in-house developed systems have available tutorials, while 57 percent of the outsourced systems have the tutorials. This result implies that users of the in-house developed systems experience difficulty in using the systems since they do not have something that can be used as reference or guide in performing some tasks with the system like printing of outputs, searching of records, or simple troubleshooting. It further implies that there could be no staff who are skilled and knowledgeable in the development of tutorials. On the other hand, 50 percent of the in-house developed while 43 percent of the outsourced systems provide online help. Considering the low ratings from both groups of system, this indicates that majority of the systems provide printed materials only, such as manuals, as references or guides on the use of the systems.

Generally, HEIs with outsourced systems performed better along usability with respect to help mechanism as evidenced by higher ratings gained. This can be due to the idea that help mechanism can be easily prepared by the in-house developers.

Based on the observation, it was revealed that outsourced systems are equipped with those help mechanisms. The tutorials are available because, as mentioned by one MIS staff, the tutorials are part of the software package given by the service providers.

Figure 28 depicts the performance of in-house developed and outsourced information systems of HEIs in terms of efficiency with respect to turnaround time.

As shown in the figure, all or 100 percent of the in-house developed and outsourced systems demonstrate a good turnaround time. This denotes that both groups of information systems are completely efficient and so a certain task or request from the client can be completed immediately in a given amount of time.

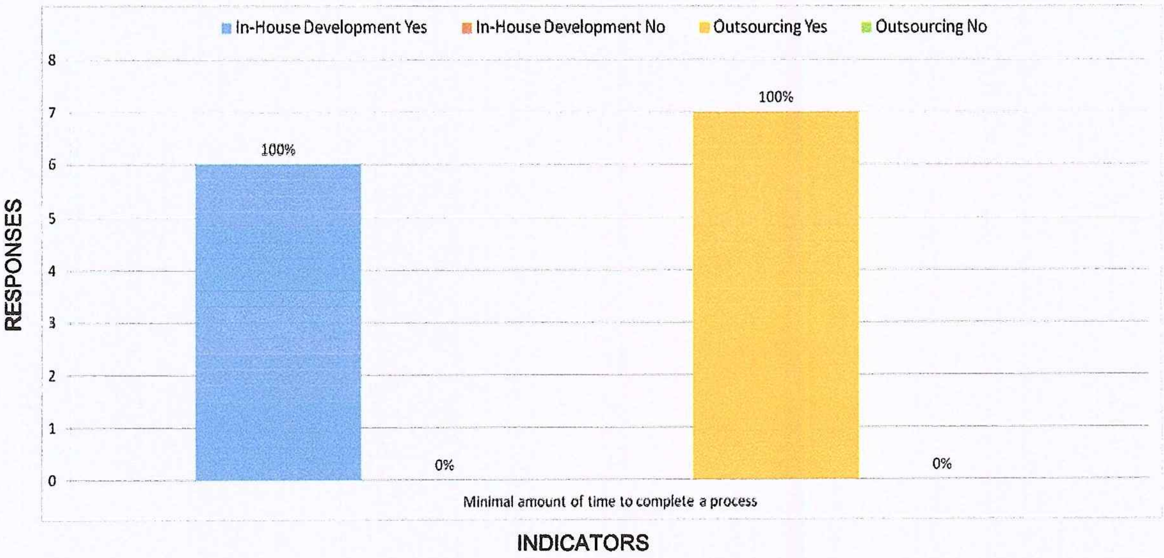


Figure 28. Performance of In-House Developed and Outsourced Information Systems of Higher Education Institutions in terms of Efficiency with respect to Turnaround Time

Based on the physical observation on efficiency, in-house developed systems showed that each process or task can be completed in less than a minute, like printing of COR or a receipt. Similarly, the outsourced systems perform every task with a minimal amount of time. The task, for example printing of a receipt or certificate of registration Certificate of Registration (COR), could be completed in an average of 5 seconds. However, one IT staff mentioned that the time to finish a task is affected either by the volume of work which causes a delayed processing time or by the previously mentioned user factor. The loss of network connectivity and power interruption were also cited as factors that affect the turnaround time.

Figure 29 depicts the performance of in-house developed and outsourced information systems of HEIs in terms of efficiency with respect to throughput.

The result shows that in-house developed systems perform better with respect to throughput as evidenced by the 100 percent rating compared to the 86 percent rating from the outsourced systems. This indicates that in-house developed systems accomplish many related tasks, like in the enrolment, that can be completed with less amount of time. This result emerged due to the idea that the problems encountered in in-house developed systems can be easily fixed since the in-house developers could determine immediately the causes of the problems; hence, more tasks can be completed in a given time. In the case of other outsourced systems, performance in throughput is affected when problems are not immediately fixed due to the service providers' delayed response in fixing said problems.

The physical evaluation with respect to throughput revealed that in-house developed systems can complete the entire set of transactions in an average of 35 minutes. However, the time of throughput depends on the enrolment procedures observed in every HEI. For instance, one SUC HEI grouped the enrolment processes into three, namely 1) pre-enrolment, 2) during enrolment, and 3) post enrolment. Other HEIs have a shorter enrolment procedures, hence a more efficient throughput. Moreover, the efficiency of the in-house developed systems tend to slow down during peak hours of the enrolment according to one MIS staff. With this problem, he suggested for fiber optic technology in order to achieve efficient and stable processing and sharing of data through a network. Other systems can take minutes or an hour to fix system failure which affected more in achieving a better throughput.

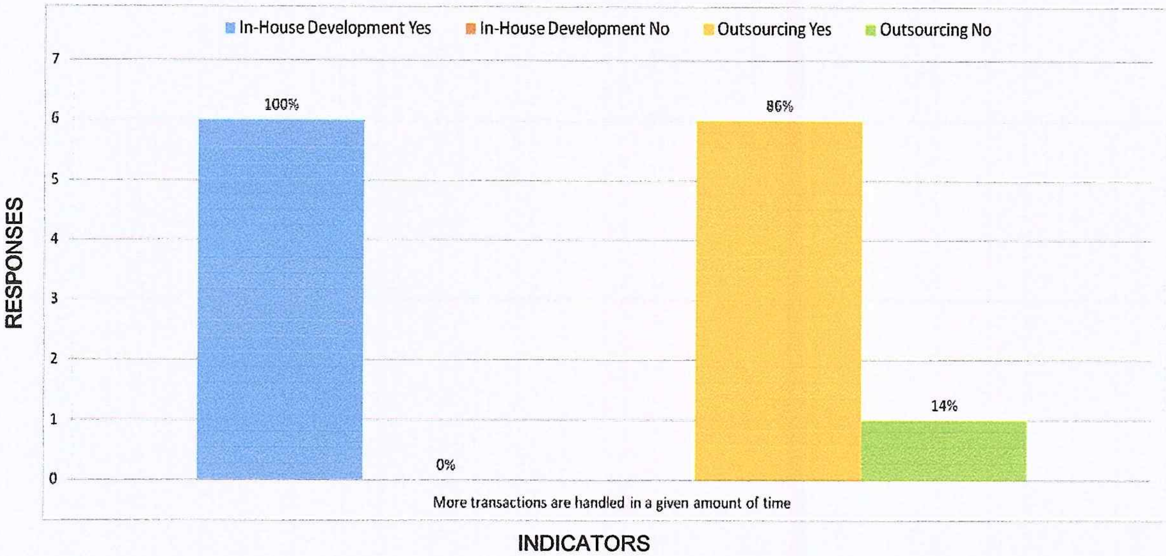


Figure 29. Performance of In-House Developed and Outsourced Information Systems of Higher Education Institutions in terms of Efficiency with respect to Throughput

On the other hand, the result of the physical evaluation on throughput for the outsourced systems was found out that these systems could handle all transactions for an average of 5 to 13 minutes as in the case of enrollment. However, said amount of time to handle all transactions is not necessarily true to all outsourced systems because each HEI is unique in terms of enrollment procedures. Some HEIs have lengthy enrollment procedures which would take more than an hour, while some have shorter procedures which could be completed in less than an hour. In effect, the amount of time in handling all transactions vary.

In addition, other factors like failure of LAN connection, power failure, and inefficient user affect in achieving desirable throughput. One IT staff also revealed that the time to compete all transactions depends on the queue or the volume clients requesting for services like the students during enrollment.

Figure 30 depicts the performance of in-house developed and outsourced information systems of HEIs in terms of sustainability with respect to maintainability.

As shown in the figure, 83 percent of the in-house developed systems easily modify the source code while only 14 percent of the outsourced systems can modify the codes. The big difference in the result emerged because being in-house developed systems, the HEIs have the total control and access to the code. In contrast, HEIs with outsourced systems do not have the full rights to the source codes of the system as it is owned by the developers/providers and so they are restricted to access and manipulate the code. Furthermore, 67 percent of the in-house developed and 86 percent of the outsourced systems enable different access privileges to be assigned to individual users or groups. This means that many of the users who can do their own maintenance activities due to access privileges come from the outsourced systems than the in-house developed systems which offer limited access.

Based on the results of the observation in terms of sustainability with respect to maintainability, it was found out that most of the source code of outsourced systems were not allowed to be modified since only the service providers have the full access to the source codes and can do some manipulations. As cited by one MIS Director of an SUC, the source code were not given to them. With this setup, solving a problem on source code has become difficult. In most cases, the service providers are not always available. The in-charge of the system would make a call to the service provider for a solution whenever problems involving source codes occur. One MIS staff suggested for the acquisition of the high-end operating system requirements to achieve sustainability.

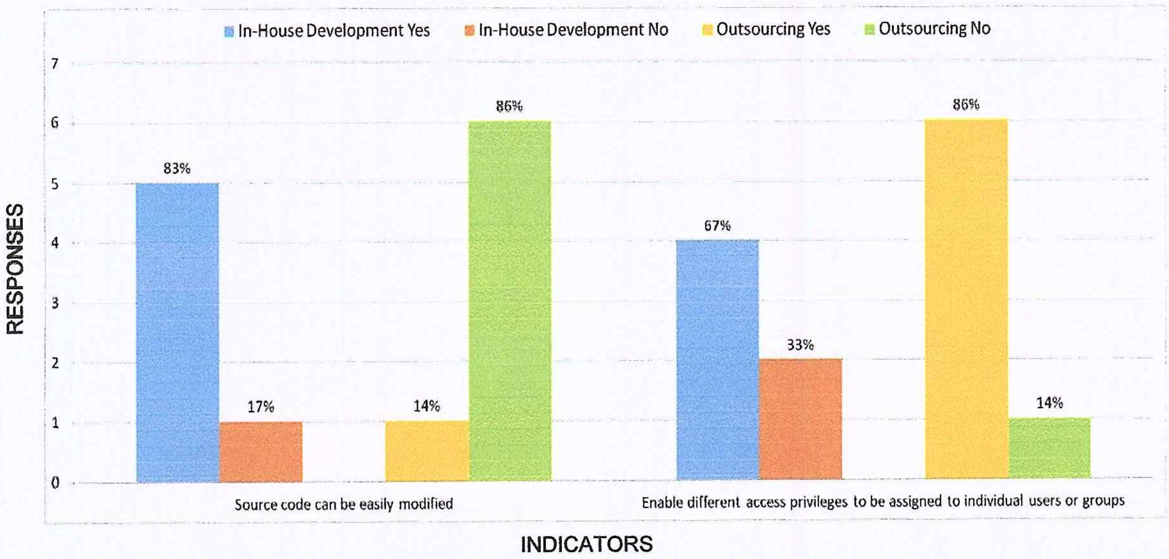


Figure 30. Performance of In-House Developed and Outsourced Information Systems of Higher Education Institutions in terms of Sustainability with respect to Maintainability

Figure 31 reveals the performance of in-house developed and outsourced information systems of HEIs in terms of sustainability with respect to adaptability.

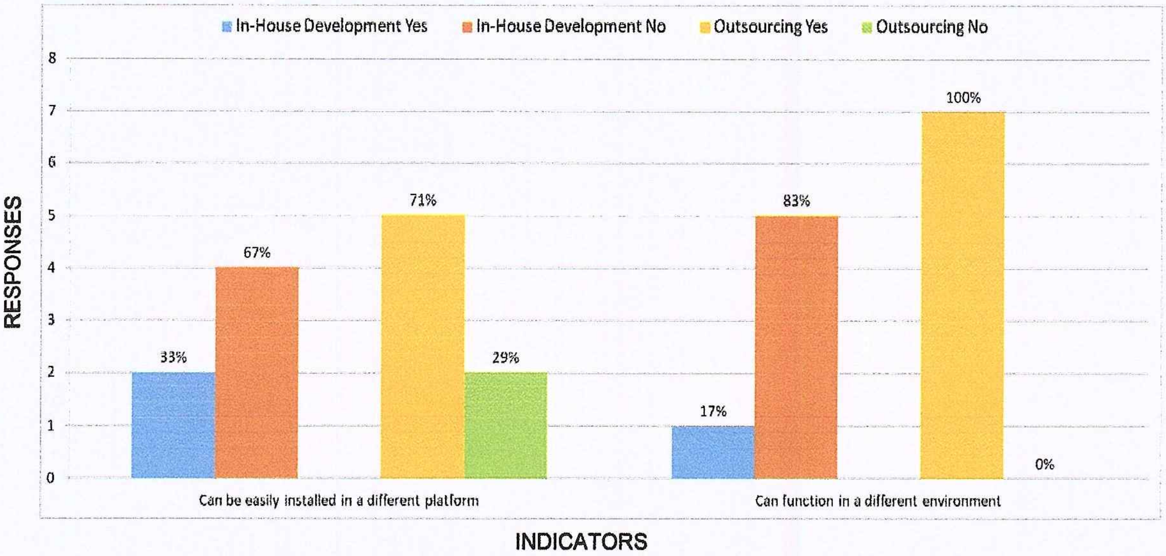


Figure 31. Performance of In-House Developed and Outsourced Information Systems of Higher Education Institutions in terms of Sustainability with respect to Adaptability

The result shows that 33 percent of the in-house developed systems and 71 percent of the outsourced systems can be easily installed in a different platform. This indicates that in-house developed have limited capability to be installed in a different version of the operating systems like the Windows. Most of these in-house developed systems function only in a Windows operating system where they were originally developed unlike the outsourced systems. Furthermore, 17 percent of the in-house developed and 100 percent of the outsourced systems can function in a different environment. With such a big difference in the rating, it means that outsourced systems are completely capable to operate in a different computer in a different location/office than the in-house developed systems.

Based on the observation, it was found out that most of the outsourced systems were capable to adapt in different environments, like in Windows XP or Windows 10. This is a clear indication that outsourced systems were Windows-based systems only and could not run in other platforms.

Figure 32 reveals the performance of in-house developed and outsourced information systems of HEIs in terms of sustainability with respect to documentation.

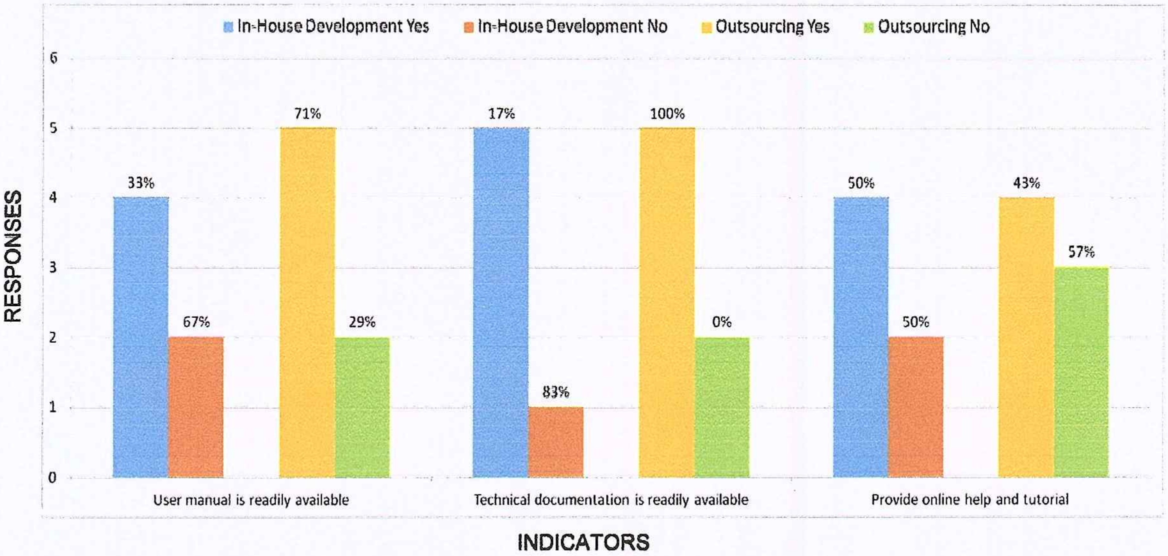


Figure 32. Performance of In-House Developed and Outsourced Information Systems of Higher Education Institutions in terms of Sustainability with respect to Documentation

As shown in the figure, 33 percent of the in-house developed and 71 percent of the outsourced systems have a readily available user manual. Moreover, 17 percent of the in-house developed and 100 percent of the outsourced systems have a readily available technical documentation. On these two indicators, the outsourced systems have readily available user manual and technical documentation because when outsourcing of information systems, these manuals are provided as part of the software package. For in-house developed system, the preparation of user manuals are less performed due to lack of knowledge in user manual development and the in-house programmers focus more in system development. However, the two groups of systems slightly differ on providing online help and tutorial with 50 percent for in-house developed and 43 percent for outsourced systems. This indicates that online help are rarely provided because most of the systems do not have embedded online help.

As revealed in the observation, other in-house developed systems have embedded online help. For outsourced systems, it was observed the user manuals, systems manuals, and other forms of documentation were readily available. These documentations were already prepared by the service providers. In addition to documentation, other the support activities that helped achieve sustainability of information systems were conducted. According to the MIS Head of an SUC with in-house developed information system, a training is conducted during the deployment of the newly developed system.

For other observations relative to systems performance, it was exposed by one IT faculty member that the performance of their system was affected by the willingness or commitment of the concerned employees to participate in the decision-making and implementation of the systems. Therefore, it is evident that the concerned employees do not actively participate in the decision-making.

Moreover, one SUC HEI implied for the institutionalization of the rules and regulations of the school and made those rules and regulations embedded in the system, strict implementation of policies such as deadline of enrolment, dropping, and change of subjects. Same HEI also experienced a challenging task of modifying the system by integrating the K12 subjects. The MIS Director specifically cited some K12-related processes that need to be embedded in the system: hours must be converted to units, fees must be specified, and payment of fees may also be classified as lumped or individual.

On the other hand, it was further observed that outsourced systems were template-based. This means that the screen design, layout, and functionalities of these systems were all similar. They only differ on the data or contents of the database which depends on their HEI-client. Other outsourced systems have a limited scope. These systems cater only a few services of the school. However, some HEIs presently work on the expansion of the system, so that it could cater more services. Along this line, one private HEIs has planned to expand the system by including other services like clinic, guidance, and canteen. One SUC HEI has already made the revisit of the completed modules of the systems and determined the areas that need to be completed and refined. Based on the results of revisit, said SUC HEI started to work on the Phase 2 of the IS project in agreement with the Service Provider.

Significant difference on the performance of in-house developed and outsourced Information Systems of HEIs

Table 33 presents the test of significant difference on the performance of the in-house developed and outsourced information systems of HEIs in terms of functionality.

Table 33

Test of Significant Difference on the Performance of the In-house Developed and Outsourced Information Systems of Higher Education Institutions in terms of Functionality

Indicators	In-house Development		Outsource Development		Mean Difference	t-test	df	p-value
	Mean	SD	Mean	SD				
1. Access	1.26	0.191	1.20	0.080	0.056	0.706ns	11	0.495
2. Data Entry and Create Records	1.17	0.135	1.13	0.076	0.039	0.662ns	11	0.522
3. Search and Retrieve Records	1.37	0.082	1.14	0.151	0.224	3.231*	11	0.008
4. Records Processing	1.20	0.400	1.06	0.098	0.143	0.920ns	11	0.377
5. Edit and Update Records	1.12	0.209	1.00	0.000	0.125	1.593ns	11	0.139
6. Delete Records	1.70	0.395	1.00	0.000	0.700	4.725**	11	0.001
7. Reports Generation	1.17	0.332	1.00	0.000	0.167	1.338ns	11	0.208
8. Interoperability	1.33	0.516	1.14	0.263	0.190	0.859ns	11	0.409
9. Error Prevention and Control	1.40	0.219	1.03	0.076	0.371	4.228**	11	0.001
10. Security	1.17	0.408	1.00	0.000	0.167	1.088ns	11	0.300
Overall	**1.29**	**0.182**	**1.07**	**0.046**	**0.220**	**3.107***	**11**	**0.010**

Legend:
ns – Difference is not significant at 0.05 level (p-value > 0.05)
* – Difference is significant at 0.05 level (p-value < 0.05)
** – Difference is highly significant at 0.05 level (p-value < 0.01)

As shown in the table, the performance between the two groups of information systems is significantly different on search and retrieve records as demonstrated by the t-value 3.231 with a p–value of 0.008 which is less than 0.05. It further shows that the difference in the performance between the two groups of information systems is highly significant on delete records and error prevention and control as demonstrated by the t-values 4.725, and 4.228, respectively with similar p–values 0.001 which are less than 0.01. On the other hand, the two groups of information systems have similar performance on access, data entry and create records, records processing, edit and update records, reports generation, interoperability, and security.

Overall, the computed t-value 3.107 with a p-value of 0.010 which is less than 0.05 implies that in-house developed and outsourced information systems have no similar performance with respect to functionality. As a result, the hypothesis stating that there is no significant difference between the in-house developed and outsourced Information Systems of HEIs in terms of functionality is rejected.

Table 34 depicts the test of significant difference on the performance of the in-house developed and outsourced information systems of HEIs in terms of reliability.

The figures in the table show that there is no significant difference in the performance of the two groups of information systems with respect to minimal error, fault tolerance, backup and recovery, and scalable with t-values 0.555, 1.132, 1.673, and 1.328, respectively with each of the p-value greater than 0.05.

Table 34

Test of Significant Difference on the Performance of the In-house Developed and Outsourced Information Systems of Higher Education Institutions in terms of Reliability

Indicators	In-house Development		Outsource Development		Mean Difference	t-test	df	p-value
	Mean	SD	Mean	SD				
1. Minimal Error	1.17	0.408	1.07	0.189	0.095	0.555ns	11	0.590
2. Fault Tolerance	1.42	0.376	1.21	0.267	0.202	1.132ns	11	0.282
3. Backup and Recovery	1.28	0.444	1.00	0.000	0.278	1.673ns	11	0.123
4. Scalable	1.28	0.444	1.05	0.125	0.231	1.328ns	11	0.211
Overall	**1.29**	**0.300**	**1.08**	**0.111**	**0.204**	**1.681ns**	**11**	**0.121**

Legend:

ns – Difference is not significant at 0.05 level (p-value > 0.05)

The figures above eventually resulted to the overall computed t-value 1.681 with a p-value of 0.121 which is greater than 0.05. This implies that the in-house developed and outsourced information systems perform similarly when it comes to the reliability. The two groups of information system can perform with slight errors, continue to operate even with the occurrence of errors, maintain backup of records, and continue to function amid concurrent use from multiple users. Hence, the hypothesis stating that there is no significant difference between the in-house developed and outsourced Information Systems of HEIs in terms of reliability is accepted.

Table 35 displays the test of significant difference on the performance of the in-house developed and outsourced information systems of HEIs in terms of usability.

Table 35

Test of Significant Difference on the Performance of the In-house Developed and Outsourced Information Systems of Higher Education Institutions in terms of Usability

Indicators	In-house Development		Outsource Development		Mean Difference	t-test	df	p-value
	Mean	SD	Mean	SD				
1. Navigation	1.06	0.135	1.00	0.000	0.055	1.088ns	11	0.300
2. Interface	1.42	0.258	1.00	0.000	0.417	4.302**	11	0.001
3. Ease of Use	1.11	0.202	1.10	0.131	0.016	0.172ns	11	0.867
4. Help Mechanism	1.84	0.181	1.43	0.460	0.406	2.022ns	11	0.068
Overall	**1.35**	**0.107**	**1.13**	**0.119**	**0.223**	**3.527***	**11**	**0.005**

Legend:

ns – Difference is not significant at 0.05 level (p-value > 0.05)

* – Difference is significant at 0.05 level (p-value < 0.05)

** – Difference is highly significant at 0.05 level (p-value < 0.01)

As seen from the table, there is a highly significant difference between the two groups of information systems on interface as evidenced by the t-value 4.302 with p-value of 0.001 which is less than 0.01. This means that there is almost certain difference between the two groups of information systems with respect to interface. On the other hand, there is no significant difference between the two groups of systems with respect to navigation, ease of use, and help mechanism.

In general, the computed t-value 3.527 with p-value of 0.005 less than 0.05 denotes that in-house developed and outsourced information systems are not alike in the performance with respect to usability. As a result, the hypothesis stating that there is no significant difference between the in-house developed and outsourced Information Systems of HEIs in terms of usability is rejected.

Table 36 exhibits the test of significant difference on the performance of the in-house developed and outsourced information systems of HEIs in terms of efficiency.

Table 36

Test of Significant Difference on the Performance of the In-house Developed and Outsourced Information Systems of Higher Education Institutions in terms of Efficiency

Indicators	In-house Development		Outsource Development		Mean Difference	t-test	df	p-value
	Mean	SD	Mean	SD				
1. Turnaround Time	1.00	0.000	1.00	0.000	–	–	–	–
2. Throughput	1.00	0.000	1.14	0.378	-0.143	-0.920ns	11	0.377
Overall	**1.00**	**0.000**	**1.07**	**0.189**	**-0.071**	**-0.920ns**	**11**	**0.377**

Legend:

– t cannot be computed because the standard deviations of both groups are 0

ns – Difference is not significant at 0.05 level (p-value > 0.05)

It can be gleaned from the table that there is no significant difference between the two groups of information systems with respect to throughput as demonstrated by the t-value 0.920 with p-value of 0.377 which is greater than 0.05. This indicates that both groups of information systems can handle more transactions in a given amount of time. However, the results further reveal that the t-test cannot be computed with respect to turnaround time because the standard deviations from both groups are 0. Such result emerged because the turnaround time is commonly existing and completely functional to both in-house developed and outsourced systems. This result tells that that any information system completes a process in a minimal amount of time.

Generally, the t-value 0.920 with p-value 0.377 greater than 0.05 implies that in-house developed and outsourced information systems have a similar performance with respect to efficiency. Both groups of information systems can handle each task with less amount of time and eventually accomplish the entire process, like the enrolment. In effect, the hypothesis stating that there is no significant difference between the in-house developed and outsourced Information Systems of HEIs in terms of efficiency is accepted.

Table 37 exhibits the test of significant difference on the performance of the in-house developed and outsourced information systems of HEIs in terms of sustainability.

Table 37

Test of Significant Difference on the Performance of the In-house Developed and Outsourced Information Systems of Higher Education Institutions in terms of Sustainability

Indicators	In-house Development		Outsource Development		Mean Difference	t-test	df	p-value
	Mean	SD	Mean	SD				
1. Maintainability	1.25	0.418	1.50	0.289	-0.250	-1.271ns	11	0.230
2. Adaptability	1.75	0.418	1.14	0.244	0.607	3.261*	11	0.008
3. Documentation	1.28	0.444	1.33	0.471	-0.055	-0.214ns	11	0.835
Overall	**1.42**	**0.303**	**1.33**	**0.271**	**0.098**	**0.613ns**	**11**	**0.552**

Legend:

ns – Difference is not significant at 0.05 level (p-value > 0.05)

* – Difference is significant at 0.05 level (p-value < 0.05)

Based on the data presented, it shows that the two groups of information systems significantly differ with respect to adaptability as illustrated by the t-value 3.261 with p-value of 0.008 which is less than 0.05. On the other hand, the two groups of information systems do not differ on maintainability and documentation.

It can be deduced from the overall result with computed t-value of 0.613 with p-value of 0.552 which is greater than 0.05 level implies that the in-house developed and outsourced information systems perform similar activities that keep sustain their operation. With this result, the hypothesis stating that there is no significant difference between the in-house developed and outsourced Information Systems of HEIs in terms of sustainability is accepted.

Table 38 reveals the summary of the test of significant difference on the performance of the in-house developed and outsourced information systems of HEIs.

The data show that there is a significant difference between the two groups of information systems with respect to functionality and usability as evidenced by the t-values 3.107 and 3.527, respectively which each of the p-value is less than 0.05. On the other hand, the two groups on information systems have the same performance with respect to reliability, efficiency, and sustainability.

In general, the t-value 1.990 with p-value of 0.072 which is greater than 0.05 implies that the in-house developed and outsourced systems have the same performance based on the five indicators. With this overall results, the hypothesis in the study is accepted.

Table 38

Test of Significant Difference on the Performance of the In-house Developed and Outsourced Information Systems of Higher Education Institutions

Indicators	In-house Development		Outsource Development		Mean Difference	t-test	df	p-value
	Mean	SD	Mean	SD				
1. Functionality	1.29	0.182	1.07	0.046	0.220	3.107*	11	0.010
2. Reliability	1.29	0.300	1.08	0.111	0.204	1.681ns	11	0.121
3. Usability	1.35	0.107	1.13	0.119	0.223	3.527*	11	0.005
4. Efficiency	1.00	0.000	1.07	0.189	-0.071	-0.920ns	11	0.377
5. Sustainability	1.42	0.303	1.33	0.271	0.098	0.613ns	11	0.552
Overall	**1.27**	**0.151**	**1.14**	**0.089**	**0.134**	**1.990ns**	**11**	**0.072**

Legend:

ns – Difference is not significant at 0.05 level (p-value > 0.05)

* – Difference is significant at 0.05 level (p-value < 0.05)

The general analysis of the results indicate that both groups of systems are the same when it comes to performance. Both systems have limitations in the design and functionality. The overall findings of the physical evaluation/observation suggest that two groups of systems have been delivered and utilized with technical problems as evidenced by the missing indicators.

However, the outsourced systems have better performance than the in-house developed systems because most of the indicators of functionality, reliability, usability, efficiency, and sustainability were present. These findings are attributed to the idea that outsourced systems are industry-based in which most of the standards in system development are satisfied due to expertise. In addition, most of the outsourced systems are tested and the service providers have a proven track record. In contrast, in-house developed systems have a fair performance due to limitations in the resources and expertise.

These findings in the comparison of the performance of in-house developed and outsourced systems can be good inputs to HEIs that are planning for the acquisition of information systems. The characteristics of these two groups of systems can be a good reference in the decision-making relative to information system acquisition.

Chapter 5

SUMMARY OF FINDNGS, CONCLUSIONS, AND RECOMMENDATIONS

This chapter presents the summary of findings, conclusions, and recommendations of the study that provided bases for the formulation of the inputs for the Information System Acquisition Decision Model.

Summary of Findings

The following were the major findings of the study.

1. The profile of HEIs in terms of current IS utilization showed that students' enrollment and records management, finance and accounting management, and payroll processing ranked 1, 2, and 3 respectively. On the mode of IS project acquisition, 7 (53.85 percent) out of 13 HEIs surveyed acquired their information systems via outsourcing and 6 (46.15 percent) acquired through in-house development. As regards to IS implementation duration, majority of the HEIs 8 (61.54 percent) had been implementing their information systems for 5 years. Furthermore, there were 6 (46.20 percent) HEIs whose information systems had a budget allocation of Php1,000,000 and below. Nevertheless, some HEIs did not disclose the allocated budget of their information systems due to confidentiality and difficulty in determining the exact amount.

On the IS management structure, 10 (76.92 percent) of the HEIs had at most 2 personnel who manage the system. Moreover, most of the HEIs 11 (84.60 percent) have qualified head and personnel and 5 (38.46 percent) have an organizational structure of the office that manage the information system.

As regards to activities that support the operation of the information system, it showed that the top 3 activities for outsourced information systems were the on-going technical support such as the warranty and enhancement, communication between service provider and HEI, and training and orientation on the use of the system. For in-house developed systems, the top 5 activities were the on-going technical support like maintenance and enhancement, monitoring and evaluation of cost, assessment of problems and risks, assessment of the performance of the developed system, and debugging of the developed system.

2. On management strategies utilized by HEIs in-house development, it was revealed that all management strategies were highly implemented. Among these strategies, directing earned the highest weighted mean of 3.71, while planning earned the lowest weighted mean of 3.64. In general, the grand mean of 3.67 implies that the management strategies in in-house development of information systems are well employed but need more enforcement to achieve full implementation.

For outsourcing, it was revealed that all the management strategies were highly implemented. Among the management strategies, directing earned the highest weighted mean of 3.87 while monitoring and evaluation earned the lowest weighted mean of 3.56. In general, the overall mean of 3.67 implies that the management strategies in outsourcing of information systems are conducted well but requires a more intensive application to attain complete implementation.

3. On the practices of in-house development of Information System projects, the findings showed that all the practices were often practiced. Among the practices, documentation and risk management earned the highest weighted mean of 3.71, while cost management earned the lowest weighted mean of 3.58. The grand mean 3.64 implies that all the practices employed in in-house development need consistent execution in order to achieve effective in-house development of information systems by HEIs.

On the practices of outsourcing of Information System projects, cost management was sometimes practiced with the lowest weighted mean of 3.38. On the other hand, implementation earned the highest weighted mean of 3.82 but sometimes practiced. As a whole, the grand mean 3.59 implies that the practices associated to outsourcing of information system have to be done at all times.

4. On performance of the information systems, the outsourced systems had better performance since many of the required indicators were adequately met. Most of the indicators along functionality, reliability, usability, efficiency, and sustainability were completely existing and working.

On the other hand, the in-house developed systems performed well in some of the indicators only. This means that some of the required indicators along functionality, reliability, usability, efficiency, and sustainability were not completely existing and working.

5. The hypothesis stating, "there are no significant differences in the performance of outsourced and in-house developed information systems of HEIs in terms of functionality, reliability, usability, efficiency, and sustainability" was accepted. This means that the performance of the in-house developed and outsourced information systems are the same.

Conclusions

Based on the major findings of the study, the following conclusions were drawn:

1. Most of the information systems of HEIs in Samar were developed to cater the needs of the students like enrollment and records management. These information systems are fairly mature having been implemented at a maximum of five years. Most of the information systems are not too complex or have a limited scope considering the fair budget allocation which does not exceed one million pesos.

The offices that manage the information systems are small offices as evidenced by a few assigned personnel and the absence of organizational structure. However, the head and personnel assigned in the offices are qualified. The activities that support the operation of the in-house developed systems are commonly on-going technical support, like maintenance and enhancement, while the outsourced systems are similarly on-going technical support such as warranty and enhancement.

2. The management strategies utilized by HEIs for in-house development and outsourcing of information system projects in terms of planning, organizing, directing, controlling, and monitoring and evaluation are widely utilized but lack of enforcement. Such lack of enforcement is attributed to the limitations in the resources.

3. The practices for in-house development and outsourcing of information systems projects in terms of requirements determination, implementation, documentation, assessment, cost management, and risk management are not extensively imposed due to the limitations in the technical knowhow and insufficient resources.

4. The outsourced systems have better design and architecture compared to in-house developed ones since the previous are equipped with more features and functionalities but the latter are not.

5. In general, the in-house developed and outsourced information systems have similar performance because both methods of acquisition have limitations and issues that need to be address.

Recommendations

Based from on the aforementioned findings and conclusions, the following recommendations are advanced:

1. Increase the budget for the acquisition of the information system. By doing so, an HEI can acquire a more sophisticated and larger system that can

ultimately cater their needs. The office in charge of the system should be managed by trained personnel and likewise hire more personnel if necessary. In addition to maintenance and enhancement, other forms of support to the operation of the information system should be done.

2. The strategies that are utilized in managing the systems for both outsourcing and in-house development should be completely implemented and firmly enforced. This will provide reliable and secure results in the in-house development and outsourcing of information systems by HEIs. In order to achieve such complete implementation and firm enforcement of the strategies, the needed resources that are required should be provided.

3. The practices that are observed in in-house development and outsourcing of information system should be performed at all times. However, sufficient technical know-how and resources should be provided so that the required activities be strictly practiced.

4. In-house developed systems should be designed well in order to improve its performance. Important features and functionalities should be considered during the development of the systems. Along this line, it is suggested that in-house developers and programmers should have sufficient technical know-how and training in building large and complex systems.

5. The proposed Information System Acquisition Decision Model may be utilized by other HEIs as aid in the decision-making process for information system acquisition.

6. A replication study may be made among HEIs outside of Samar Province. Furthermore, the researcher recommends this study as guide for other researchers who are taking similar studies in the future.

Chapter 6

HIGHER EDUCATION INSTITUTIONS INFORMATION SYSTEMS ACQUISITION DECISION MODEL

Rationale

Some IS projects of HEIs failed due to a wrong decision made in selection of the acquisition method. Such failure is attributed to insufficient understanding of the requirements in IS acquisition. To address this issue, HEIs need to consider well-thought plans, assessment, and decisions before deciding for outsourcing or in-house development as the suitable option in acquiring information systems. Moreover, organizations will be able to arrive at a right decision if they can achieve a true competitive advantage with an in-house developed or outsourced information system.

Consistent with the above premise on the decision to acquire information systems, there were a number of theories and models introduced that exhibit relevant information along information system acquisition. In the "Make-or-Buy" decision for software investments of Sena & Sena (2010: 1), the scenario of whether to develop in-house or buy IT resources has been considered a classic management issue. The authors further cited that the make or buy decisions of IT resources in every firm uses thousands of inputs, and for each input there is a potential to either manufacture the input or acquire it on the market. Along the issue on whether to buy or build the system, McManus (2003) introduced his research model that showed the key considerations for making the decision to build or buy an integrated systems. These key considerations include facilitation, cost, time, staff willingness, top level support, practicality, results, skills/resources, and operational.

There are also models and frameworks that are used as anchorage in information systems management. The Software Project Management (SPM) by Futrell, Shafer & Shafer (2001) is a specialization of general management studies that utilizes the typical management skills of planning, organizing, staffing, leading or directing, and controlling to achieve defined project objectives (Shaikh & Ahsan, 2015: 118). In addition to SMP, The IT Governance is another framework that is relevant to information systems management. The IT Governance is a decision-making process that involves investments in IT. It includes defining the decision-making process itself, as well as defining who makes the decisions, who is held accountable for results, and how the results of decisions are communicated, measured, and monitored. There are five key activities introduced which are needed for effective IT governance, namely 1) risk management, 2) resource management, 3) performance measurement, 4) strategic alignment, and value delivery (Reynolds, 2010: 118). These two models showed relevant information that are significant to managing information systems, either outsourcing or in-house development.

On the other hand, the Theoretical Model for Information Administration of Krishnaveni and Meenakumari (2010: 284) showed the integration of the functional areas of information administration that are of great significance to day-to-day management of higher education institutions, namely: 1) Student administration, 2) Staff administration, and 3) General Administration. This Model depicts the use of information systems as tools in information administration of HEIs.

Many popular theories which are associated to IS/IT outsourcing have also been introduced. The Transaction Cost Theory (TCT) developed by Williamson (1985) defines that transaction costs are related to the effort, time, and costs associated with searching, creating, negotiating, monitoring, and enforcing a service contract between buyers and suppliers (Dhar & Balakrishnan, 2006: 41). TCT Model suggests that firms and individuals seek to economize on transaction cost, much as they do on production cost (Laudon & Laudon, 2012: p. 89). This theory suggests that HEIs should consider the inclusion of all types of costs as these costs are equated to the overall cost of system development. The Unified Framework for Outsourcing Governance developed by Meng, He, Yang and Ji (2007) is another model that presents a unified framework on the governance of outsourcing from the combined perspectives of the customer and the provider. The framework focuses on three areas: a) governance processes; b) organizational structure of governance; and c) performance measurement (Garcia, Vicente, & Aragones, 2013: 40).

For the model development, the Process Modeling provided detailed activities in model development. This model consists of the basic steps used for model building: 1) model selection; 2) model fitting; and 3) model validation.

These three basic steps are used iteratively until an appropriate model for the data has been developed (Engineering Statistics Handbook, 2013). This Process Modeling offers significant inputs to HEIs in determining the appropriate information system acquisition method.

The above theories and models have brought impact in the pursuit of this Information System Acquisition Decision Model for HEIs. The information provided by these theories and models served as basis in the formulation of the proposed model for information systems acquisition.

Objective

This Model aims to provide significant information in the decision-making of information system acquisition. It intends to determine the appropriate method that fits to HEI with regard to its decision in the acquisition of an information system based from their current condition.

Model Development

In the development of the model, the following stages were observed. These strategies are discussed and illustrated in the following section.

Stage 1: Model Building

In this stage, the proposition and assumptions were initially established. The proposition and assumptions assume that the management strategies and practices predicted the would-be outcome of the decision in outsourcing and in-house development of an information system. The proposition and assumptions were described through the following mathematical equations:

Equation 1: $y = x_1 + x_2 + x_3 + x_4 + x_5$

Where: y = management strategies for in-house development and outsourcing

x_1 = planning

x_2 = organizing

x_3 = directing

x_4 = controlling

x_5 = monitoring and evaluation

Equation 2: $y = x_1 + x_2 + x_3 + x_4 + x_5 + x_6$

Where: y = practices for in-house development and outsourcing

x_1 = requirements determination

x_2 = implementation

x_3 = documentation

x_4 = assessment

x_5 = cost management

x_6 = risk management

In order to determine potentially predictive relationships, the training dataset was utilized. The training dataset consists of the computed weighted means from the survey conducted on management strategies and practices of in-house development and outsourcing of information systems by HEIs in Samar. This dataset was used to build up the best-fit model for acquisition of information systems.

Stage 2: Model Fitting

In this stage, the dataset were fitted onto the model. The model fitting used numerical and graphical methods to illustrate clearly the relationship between the model and the data.

Management Strategies:

Table 39 shows the dataset on management strategies of in-house development and outsourcing of information systems.

Table 39

Data on Management Strategies for In-House Development and Outsourcing

y	x1	x2	x3	x4	x5
1	3.90	3.74	3.98	3.69	3.8
1	3.72	3.80	3.57	3.65	3.65
1	3.76	3.78	3.71	3.63	3.76
1	3.66	3.67	3.67	3.76	3.63
1	3.80	3.72	3.78	3.52	3.63
1	3.55	3.48	3.69	3.80	3.63
2	4.15	3.54	3.79	3.69	3.68
2	3.66	3.65	3.77	3.42	3.54
2	3.60	3.82	3.77	3.60	3.38

Using Linear Regression, the results of model fitting were obtained. These results are shown in Table 40, Table 41, and Table 42.

Table 40

Regression Statistics on Management Strategies for In-House Development and Outsourcing

Regression Statistics	
Multiple R	0.899465
R Square	0.809037
Adjusted R Square	0.490765
Standard Error	0.356803
Observations	9

Table 41

Coefficients on Management Strategies for In-House Development and Outsourcing

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	13.69903	8.930479	1.533983	0.222588	-14.7217	42.1198	-14.7217	42.1198
Planning	1.593217	0.894858	1.780412	0.173046	-1.25462	4.441055	-1.25462	4.441055
Organizing	-0.96165	1.185206	-0.81138	0.476544	-4.73351	2.8102	-4.73351	2.8102
Directing	0.500185	1.28129	0.390376	0.722327	-3.57745	4.57782	-3.57745	4.57782
Controlling	-0.93946	1.292492	-0.72686	0.519895	-5.05275	3.173826	-5.05275	3.173826
Monitoring & Evaluation	-3.64861	1.324181	-2.75537	0.070425	-7.86275	0.565526	-7.86275	0.565526

Table 42

Residual Output on Management Strategies for In-House Development and Outsourcing

Observation	Predicted Y	Residuals	Standard Residuals
1	0.975393	0.024607	0.112621
2	1.010709	-0.01071	-0.04901
3	0.781138	0.218862	1.001671
4	1.059781	-0.05978	-0.2736
5	1.515239	-0.51524	-2.35811
6	1.039666	-0.03967	-0.18154
7	1.908826	0.091174	0.41728
8	1.776824	0.223176	1.021417
9	1.932424	0.067576	0.309276

Based on the data depicted in the tables, it indicates that there is no predictor that could determine which acquisition method that fits to the decision of acquiring information system. The p-values greater than 0.05 further reveal that there is no significant difference between the management strategies and the decision whether to develop the system through in-house or through outsourcing. Therefore, the management strategies could be applicable in both acquisition methods.

The line fit plot and residual plot generated by regression showed graphically relationship between the model and the data with respect to management strategies. For a detailed presentation of these plots, refer to Figure 33 and Figure 34 in Appendix A.

Practices:

Table 43 shows the dataset on practices for in-house development and outsourcing of information systems.

Table 43

Data on Practices for In-House Development and Outsourcing

y	x1	x2	x3	x4	x5	x6
1	3.84	3.59	3.72	3.70	3.69	3.8
1	3.68	3.72	3.62	3.74	3.51	3.74
1	3.46	3.80	3.64	3.62	3.52	3.69
1	3.56	3.72	3.70	3.67	3.66	3.78
1	3.66	3.61	3.60	3.54	3.68	3.64
2	3.60	4.02	3.53	3.53	3.37	3.61
2	3.81	3.83	3.65	3.54	3.29	3.44
2	3.63	3.68	3.61	3.44	3.33	3.49
2	3.56	3.72	3.65	3.57	3.33	3.51

The use of Regression has generated the results depicted in Table 44, Table 45, and Table 46.

Table 44

Regression Statistics on Practices for In-House Development and Outsourcing

Regression Statistics	
Multiple R	0.962315
R Square	0.92605
Adjusted R Square	0.7042
Standard Error	0.286647
Observations	9

Table 45

Coefficients on Practices for In-House Development and Outsourcing

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	8.003401	12.52701	0.638892	0.588298	-45.896	61.90275	-45.896	61.90275
Requirements Determination	0.755202	0.93947	0.80386	0.505838	-3.28701	4.797413	-3.28701	4.797413
Implementation	0.481256	1.314654	0.36607	0.749408	-5.17525	6.137757	-5.17525	6.137757
Documentation	1.33771	2.760286	0.484627	0.675828	-10.5388	13.21426	-10.5388	13.21426
Assessment	-2.8955	2.529063	-1.14489	0.370785	-13.7772	7.98618	-13.7772	7.98618
Cost Management	-2.71268	1.918756	-1.41377	0.293004	-10.9684	5.543063	-10.9684	5.543063
Risk Management	1.070601	2.98394	0.358788	0.754089	-11.7683	13.90946	-11.7683	13.90946

Table 46

Residual Output on Practices Strategies for In-House Development and Outsourcing

Observation	Predicted Y	Residuals	Standard Residuals
1	0.952518	0.047482	0.331295
2	1.068704	-0.0687	-0.47936
3	1.234617	-0.23462	-1.63697
4	0.923703	0.076297	0.532338
5	0.984792	0.015208	0.106111
6	1.880922	0.119078	0.830834
7	2.114658	-0.11466	-0.79999
8	2.087598	-0.0876	-0.61119
9	1.752489	0.247511	1.726936

The data displayed in tables reveal that none of the variables could determine the methods to be adopted in the acquisition of the information system. The p-values greater than 0.05 suggest that there is no significant difference between the practices and the decision whether to develop the system in-house or outsource. Therefore, these practices could be executed in both acquisition methods. For the line fit plot and residual plot on practices, refer to Figure 35 and Figure 36 in Appendix B.

Based from the results of model fitting, the new Model has been established. This model is described in the following equation:

$$y = \varepsilon x + \beta$$

Where:

y = decision model

ε = coefficients of correction of errors

x = sum of strategies/practices

β = sum of R Square

Stage 3: Model Validation

The final stage of model development is model validation. In this stage, the model was tested using the new set of data called test dataset. The test dataset were obtained from the separate group of HEIs. There were three (3) Higher Education Institutions (HEIs) subjected to model validation. The validation of the collected data from the other group of HEIs was performed in order to determine the validity of the model. The results of model validation are shown in the succeeding pages.

Higher Education Institution (HEI) 1

Management Strategies on In-House Development and Outsourcing:

Table 47 shows the data on management strategies for in-house development and outsourcing of HEI 1.

Table 47

Data on Management Strategies for In-House Development and Outsourcing of HEI 1

y	x1	x2	x3	x4	x5
1	4.00	4.67	4.67	4.00	4.50
1	4.00	3.33	3.00	3.33	5.00
1	4.67	4.67	4.67	3.67	4.50
1	4.00	5.00	5.00	4.00	5.00
1	2.67	4.33	4.33	4.00	3.00
1	4.00	4.00	4.33	4.00	5.00
2	5.00	4.00	5.00	4.25	4.75
2	4.50	4.50	5.00	4.50	4.25
2	4.50	4.50	5.00	4.50	3.50

The above data were processed and fitted onto the model. The results of fitting are shown in Table 48, Table 49, and Table 50.

Table 48

Regression Statistics on Management Strategies for In-House Development and Outsourcing of HEI 1

Regression Statistics	
Multiple R	0.969397
R Square	0.939731
Adjusted R Square	0.839283
Standard Error	0.200448
Observations	9

Table 49

Coefficients on Management Strategies for In-House Development and Outsourcing of HEI 1

	Coefficients	Standard *Error*	*t Stat*	*P-value*	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	-1.94037	1.867935	-1.03878	0.375277	-7.88497	4.004235	-7.88497	4.004235
Planning	0.460032	0.17108	2.688987	0.074478	-0.08442	1.004484	-0.08442	1.004484
Organizing	-0.28215	0.355493	-0.79367	0.485367	-1.41348	0.849193	-1.41348	0.849193
Directing	-0.13774	0.434572	-0.31695	0.77206	-1.52074	1.245267	-1.52074	1.245267
Controlling	1.032853	0.476974	2.165429	0.118966	-0.48509	2.550797	-0.48509	2.550797
Monitoring & Evaluation	-0.2153	0.144711	-1.48778	0.233537	-0.67583	0.245236	-0.67583	0.245236

Table 50

Residual Output on Management Strategies for In-House Development and Outsourcing of HEI 1

Observation	Predicted Y	Residuals	Standard Residuals
1	1.101475	-0.10147	-0.82669
2	0.909909	0.090091	0.733947
3	1.068855	-0.06885	-0.56094
4	0.855264	0.144736	1.179122
5	0.955341	0.044659	0.363823
6	1.229694	-0.22969	-1.87125
7	1.90948	0.09052	0.737442
8	1.904254	0.095746	0.780017
9	2.065728	-0.06573	-0.53547

The data depicted in the table revealed that none of the variables can be a predictor in determining the appropriate acquisition method for HEI 1 as evidenced by the p-values greater than 0.05. This means that there is no significant difference between the management strategies and the acquisition method to be adopted. Therefore, planning, organizing, directing, controlling, and monitoring and evaluation strategies could be implemented both in in-house development and outsourcing methods in HEI 1. For the line fit plot and residual plot for HEI 1 on management strategies, refer to Figure 37 and Figure 38 in Appendix C.

Practices on In-House Development and Outsourcing:

Table 51 displays the data on practices for in-house development and outsourcing of HEI 1.

Table 51

Data on Practices for In-House Development and Outsourcing of HEI 1

y	x1	x2	x3	x4	x5	x6
1	4.67	4.50	5.00	4.67	3.67	4.33
1	4.33	5.00	5.00	4.67	3.67	4.67
1	3.67	5.00	5.00	5.00	4.00	5.00
1	4.33	4.67	5.00	5.00	3.67	5.00
1	4.33	3.33	5.00	5.00	3.33	5.00
2	4.75	4.00	5.00	4.00	4.25	4.25
2	4.25	4.25	4.75	3.75	4.25	4.25
2	3.75	5.00	4.75	3.50	4.25	4.50
2	4.25	5.00	4.25	3.50	4.25	3.50

Using Regression, the results were generated. These results are shown in Table 52, Table 53, and Table 54.

Table 52

Regression Statistics on Practices for In-House Development and Outsourcing of HEI 1

Regression Statistics	
Multiple R	0.998956
R Square	0.997914
Adjusted R Square	0.991655
Standard Error	0.048145
Observations	9

Table 53

Coefficients on Practices for In-House Development and Outsourcing of HEI 1

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	0.868489	0.842535	1.03105	0.410683	-2.75579	4.492764	-2.75579	4.492764
Requirements Determination	0.343857	0.125175	2.747009	0.110905	-0.19473	0.882442	-0.19473	0.882442
Implementation	-0.18857	0.041659	-4.52661	0.045499	-0.36782	-0.00933	-0.36782	-0.00933
Documentation	-0.60671	0.217261	-2.79253	0.107878	-1.54151	0.328092	-1.54151	0.328092
Assessment	-0.57121	0.069935	-8.16775	0.014661	-0.87211	-0.2703	-0.87211	-0.2703
Cost Management	0.820346	0.113576	7.222881	0.018634	0.331668	1.309024	0.331668	1.309024
Risk Management	0.483182	0.155777	3.101761	0.090112	-0.18707	1.153435	-0.18707	1.153435

Table 54

Residual Output on Practices for In-House Development and Outsourcing of HEI 1

Observation	Predicted Y	Residuals	Standard Residuals
1	1.02749	-0.02749	-1.14195
2	0.980574	0.019426	0.806967
3	0.995294	0.004706	0.1955
4	1.013754	-0.01375	-0.57137
5	0.987524	0.012476	0.518271
6	1.96914	0.03086	1.281932
7	2.044548	-0.04455	-1.85056
8	1.994788	0.005212	0.216531
9	1.986888	0.013112	0.544675

It can be gleaned from the above tables that there is a variation of the results on practices in HEI 1. It shows that implementation, assessment, and cost management variables could determine which method to adopt in acquiring an information systems for HEI 1 as evidenced by the p-values 0.045499, 0.014661, and 0.018634, respectively, less than 0.05 level. This suggests that HEI 1 need to look into the indicators of implementation, assessment, and cost management before deciding whether to locally develop (in-house) or outsource information systems.

On the other hand, the rest of the variables revealed a no significant difference between the acquisition decision and the practices. This means that the practices along requirements determination, documentation, and risk management could be employed both in in-house development or outsourcing methods. For the line fit plot and residual plot on practices for HEI 1, refer to Figure 39 and Figure 40 in Appendix D.

Higher Education Institution (HEI) 2

Management Strategies on In-House Development and Outsource:

Table 55 displays the data on management for in-house development and outsourcing of HEI 2.

Table 55

Data on Management Strategies for In-House Development and Outsourcing of HEI 2

y	x1	x2	x3	x4	x5
1	3.25	3.00	2.75	2.50	3.00
1	2.75	3.25	2.75	3.00	3.25
1	3.25	3.75	3.00	3.00	3.00
1	3.25	3.50	3.00	3.00	3.00
1	2.75	3.50	3.25	3.00	3.25
1	3.25	3.00	3.25	3.25	3.00
2	5.00	4.00	5.00	4.25	4.75
2	4.50	4.50	5.00	4.50	4.25
2	4.50	4.50	5.00	4.50	3.50

The above data were processed and fitted onto the model. The results of fitting are shown in Table 56, Table 57, and Table 58.

Table 56

Regression Statistics on Management Strategies for In-House Development and Outsourcing of HEI 2

Regression Statistics	
Multiple R	0.990525
R Square	0.98114
Adjusted R Square	0.949707
Standard Error	0.112131
Observations	9

Table 57

Coefficients on Management Strategies for In-House Development and Outsourcing of HEI 2

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	-0.91909	0.472961	-1.94328	0.147239	-2.42427	0.58608	-2.42427	0.58608
Planning	0.163766	0.152794	1.071809	0.362362	-0.32249	0.650024	-0.32249	0.650024
Organizing	0.101504	0.15572	0.651839	0.56099	-0.39407	0.597073	-0.39407	0.597073
Directing	0.221408	0.278965	0.793677	0.485365	-0.66638	1.109198	-0.66638	1.109198
Controlling	0.0733	0.279433	0.262318	0.810058	-0.81598	0.962581	-0.81598	0.962581
Monitoring & Evaluation	0.065195	0.126107	0.516983	0.640867	-0.33613	0.466524	-0.33613	0.466524

Table 58

Residual Output on Management Strategies for In-House Development and Outsourcing of HEI 2

Observation	Predicted Y	Residuals	Standard Residuals
1	0.905365	0.094635	1.378192
2	0.901807	0.098193	1.430009
3	1.073496	-0.0735	-1.07034
4	1.04812	-0.04812	-0.70078
5	1.037887	-0.03789	-0.55176
6	1.071045	-0.07104	-1.03464
7	2.033994	-0.03399	-0.49507
8	1.988591	0.011409	0.166152
9	1.939695	0.060305	0.878244

The above data reveal that all the variables in management strategies could not determine which acquisition method is to be adopted. The p-values greater than 0.05 indicate that management strategies are not associated to the decision whether to in-house or outsource information systems. Therefore, HEI 2 may decide in any of the two methods. For the line fit plot and residual plot of the model for HEI 2 on management strategies, refer to Figure 41 and Figure 42 in Appendix E.

Practices on In-House Development and Outsourcing:

Table 59 depicts the data on practices for in-house development and outsourcing of HEI 2.

Table 59

Data on Practices for In-House Development and Outsourcing of HEI 2

y	x1	x2	x3	x4	x5	x6
1	2.67	4.00	4.00	2.25	2.75	3.00
1	3.67	3.67	4.00	2.25	2.75	2.50
1	3.00	3.33	3.67	2.25	3.00	2.50
1	3.33	3.33	3.33	2.50	3.25	3.25
1	3.67	2.67	3.67	2.25	3.25	2.75
2	4.75	4.00	5.00	4.00	4.25	4.25
2	4.25	4.25	4.75	3.75	4.25	4.25
2	3.75	5.00	4.75	3.50	4.25	4.50
2	4.25	5.00	4.25	3.50	4.25	3.50

The use of Regression revealed the results shown in Table 60, Table 61, and Table 62.

Table 60

Regression Statistics on Practices for In-House Development and Outsourcing of HEI 2

Regression Statistics	
Multiple R	0.999648
R Square	0.999296
Adjusted R Square	0.997184
Standard Error	0.02797
Observations	9

Table 61

Coefficients on Practices for In-House Development and Outsourcing of HEI 2

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	-1.66869	0.154177	-10.8232	0.008429	-2.33206	-1.00532	-2.33206	-1.00532
Requirements Determination	-0.01393	0.044485	-0.31308	0.783854	-0.20533	0.177477	-0.20533	0.177477
Implementation	0.131946	0.023144	5.700981	0.029417	0.032364	0.231529	0.032364	0.231529
Documentation	0.217367	0.045262	4.802452	0.040728	0.022622	0.412111	0.022622	0.412111
Assessment	0.147335	0.084408	1.745508	0.223013	-0.21584	0.510515	-0.21584	0.510515
Cost Management	0.471094	0.063191	7.455107	0.017521	0.199206	0.742982	0.199206	0.742982
Risk Management	-0.10639	0.043586	-2.44096	0.134731	-0.29393	0.081144	-0.29393	0.081144

Table 62

Residual Output on Practices Strategies for In-House Development and Outsourcing of HEI 2

Observation	Predicted Y	Residuals	Standard Residuals
1	0.99921	0.00079	0.056492
2	0.994936	0.005064	0.362072
3	1.005449	-0.00545	-0.38961
4	1.001761	-0.00176	-0.12594
5	1.000208	-0.00021	-0.0149
6	2.019096	-0.0191	-1.36544
7	1.96787	0.03213	2.297424
8	2.010362	-0.01036	-0.74093
9	2.001107	-0.00111	-0.07917

The above data reveal that the results on practices vary. It shows that implementation, documentation, and cost management variables are not associated to the acquisition decision as evidenced by the p-values 0. 029417, 0. 040728, and 0. 017521, respectively, less than 0.05 level. This means that implementation, documentation, and cost management practices could determine the outcome of the decision to be made by HEI 2 relative to the acquisition of information systems.

On the other hand, the requirements determination, assessment, and risk management are not considered as predictors of acquisition decision. This means that the practices employed along these variables could not determine the decision to be made by HEI 2 in acquiring information systems as these practices are used both in in-house development and outsourcing. For the line fit plot and residual plot of the model for HEI 2 on practices, refer to Figure 43 and Figure 44 in Appendix F.

Higher Education Institution (HEI) 3

Management Strategies on In-House Development and Outsourcing:

Table 63 displays the data on management strategies for in-house development and outsourcing.

Table 63

Data on Management Strategies for In-House Development and Outsourcing of HEI 3

y	x1	x2	x3	x4	x5
1	3.55	3.45	3.55	3.09	3.30
1	3.36	3.27	3.09	3.18	3.27
1	3.45	3.36	3.27	3.36	3.36
1	3.64	3.36	3.45	3.27	3.20
1	3.27	3.45	3.55	2.91	3.27
1	3.45	3.36	3.45	3.45	3.40
2	5.00	4.00	5.00	4.25	4.75
2	4.50	4.50	5.00	4.50	4.25
2	4.50	4.50	5.00	4.50	3.50

The use Regression revealed the results shown in Table 64, Table 65, and Table 66.

Table 64

Regression Statistics on Management Strategies for In-House Development and Outsourcing of HEI 3

Regression Statistics	
Multiple R	0.995663
R Square	0.991344
Adjusted R Square	0.976918
Standard Error	0.075963
Observations	9

Table 65

Coefficients on Management Strategies for In-House Development and Outsourcing of HEI 3

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	-2.26307	0.725772	-3.11815	0.052547	-4.5728	0.046663	-4.5728	0.046663
Planning	0.320259	0.267228	1.198449	0.316783	-0.53018	1.170699	-0.53018	1.170699
Organizing	0.517611	0.403443	1.282985	0.289634	-0.76632	1.801547	-0.76632	1.801547
Directing	-0.03272	0.318224	-0.10281	0.924604	-1.04545	0.980016	-1.04545	0.980016
Controlling	0.059531	0.197379	0.30161	0.782648	-0.56862	0.687678	-0.56862	0.687678
Monitoring & Evaluation	0.1009	0.121914	0.827631	0.468569	-0.28708	0.488884	-0.28708	0.488884

Table 66

Residual Output on Management Strategies for In-House Development and Outsourcing of HEI 3

Observation	Predicted Y	Residuals	Standard Residuals
1	1.060395	-0.0604	-1.29833
2	0.923756	0.076244	1.639031
3	1.013072	-0.01307	-0.28101
4	1.046531	-0.04653	-1.00028
5	0.95698	0.04302	0.924803
6	1.016577	-0.01658	-0.35636
7	1.977382	0.022618	0.486226
8	2.040491	-0.04049	-0.87044
9	1.964816	0.035184	0.756353

The data shown in the above tables revealed that all the variables on management strategies could not determine the decision to be made in the acquisition of information systems. The p-values greater than 0.05 implies that there is no significant difference between in-house development and outsourcing in terms of the practices; hence, these practices could be performed both in the two acquisition methods. For the line fit plot and residual plot of the model for HEI 3 on management strategies, refer to Figure 45 and Figure 46 in Appendix G.

Practices on In-House Development and Outsourcing:

Table 67 shows the data on practices for in-house development and outsourcing of HEI 3.

Table 67

Data on Practices for In-House Development and Outsourcing of HEI 3

y	x1	x2	x3	x4	x5	x6
1	3.45	3.50	3.55	3.55	3.27	3.64
1	3.45	3.45	3.55	3.18	3.00	3.55
1	3.27	3.36	3.55	2.91	3.18	3.36
1	3.27	3.27	3.45	3.40	3.36	3.45
1	3.27	3.18	3.36	3.36	3.45	3.27
2	4.75	4.00	5.00	4.00	4.25	4.25
2	4.25	4.25	4.75	3.75	4.25	4.25
2	3.75	5.00	4.75	3.50	4.25	4.50
2	4.25	5.00	4.25	3.50	4.25	3.50

The results of Regression are revealed in Table 68, Table 69, and Table 70.

Table 68

Regression Statistics on Practices for In-House Development and Outsourcing of HEI 3

Regression Statistics	
Multiple R	0.999507
R Square	0.999014
Adjusted R Square	0.996056
Standard Error	0.033099
Observations	9

Table 69

Coefficients on Practices for In-House Development and Outsourcing of HEI 3

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	-2.70012	0.472072	-5.71972	0.029233	-4.73128	-0.66896	-4.73128	-0.66896
Requirements Determination	1.013778	0.426638	2.376203	0.140676	-0.8219	2.849453	-0.8219	2.849453
Implementation	0.027467	0.081076	0.338777	0.76704	-0.32137	0.376308	-0.32137	0.376308
Documentation	-1.11125	0.696436	-1.59562	0.251633	-4.10777	1.885274	-4.10777	1.885274
Assessment	-0.88275	0.388699	-2.27105	0.151131	-2.55519	0.789683	-2.55519	0.789683
Cost Management	1.02203	0.327022	3.125265	0.088936	-0.38503	2.429092	-0.38503	2.429092
Risk Management	1.063321	0.55367	1.920497	0.194766	-1.31893	3.445571	-1.31893	3.445571

Table 70

Residual Output on Practices Strategies for In-House Development and Outsourcing of HEI 3

Observation	Predicted Y	Residuals	Standard Residuals
1	1.02737	-0.02737	-1.65382
2	0.980968	0.019032	1.149988
3	1.016294	-0.01629	-0.98453
4	0.972062	0.027938	1.688132
5	1.005497	-0.0055	-0.33218
6	2.000681	-0.00068	-0.04116
7	1.999159	0.000841	0.050817
8	1.999388	0.000612	0.036963
9	1.99858	0.00142	0.085775

Based on the above data, it shows that none of the variables on practices could be a predictor in determining the acquisition method in HEI 3. The p-values greater than 0.05 implies that there is no significant difference between the practices and the decision whether to select in-house development or outsourcing; hence, these practices are applicable to both acquisition methods.

For the line fit plot and residual plot of the model for HEI 3 on practices, refer to Figure 47 and Figure 48 in Appendix H.

Summary of Model Validation:

The information below summarizes the application of the model, $y = \varepsilon x + \beta$, to different datasets from the three HEIs. In this stage, *y* represents the decision model and *x* represents the sum of management/practices. The *x* was calculated by adding the average means of the x variables of management strategies and practices. Table 71 and Table 72 show the decision model for management strategies and practices.

Table 71

Decision Model on Management Strategies

	HEI_01	HEI_02	HEI_03
Standard Error	0.200448	0.112131	0.075963
R square	0.939731	0.98114	0.991344
x	21.45	17.83	18.68
y	5.24	2.98	2.41

Table 72

Decision Model on Practices

	HEI_01	HEI_02	HEI_03
Standard Error	0.048145	0.02797	0.033099
R square	0.997914	0.999296	0.999014
x	26.42	21.64	22.57
y	2.27	1.60	1.75

The line fit plot and residual plots were also presented to provide a graphical presentation of the model validation to the three HEIs (refer to Figure 49 and Figure 50 in Appendix I). The plots show that there is a positive relationship between the decision model and management strategies/practices. The data points for management strategies are tightly near to the line. On the other hand, data points for practices are located along the line, showing a very positive relationship. It shows further that as the values of management strategies and practices increase, the decision for the acquisition of the information system increases.

Conclusion

Based on the above findings, the researcher has arrived at a conclusion that the proposed Information Systems Acquisition Decision Model is useful in the decision-making process of acquiring information systems. Through this model, HEIs will be able to arrive at a good decision (in-house development or outsourcing) since it generates results based on the current condition of HEIs. The gathered data from HEIs, like the availability of the resources, IT competency and capabilities, and management support, will likely predict the outcome of HEIs' decision, that is, in-house development or outsourcing. With this, the researcher recommends that this model be utilized by other HEIs.

BIBLIOGRAPHY

Baldauf, K. J., & Stair, R. (2009). *"The world of Information Technology.* Singapore: Course Technology Cengage Learning.

Bateman, T. S. & Snell, S. A. (2005). *Management leading and collaborating in a competitive world.* Boston: McGraw-Hill/Irvin.

Calmorin, L. P. & Calmorin, M. A. (1995). *Methods of research and thesis writing/*Rex Book Store: Manila.

Gray, C. F. & Larson, E. W. (2009). *Project Management. The managerial process.* 4th ed. New York: McGraw-Hill.

Futrell, R, Shafer L., & Shafer D. (2001). *Quality software project management.* Prentice Hall, PTR.

Haag, S. & Cummings, M. (2009). *Management Information Systems for the information.* 7th ed. New York: McGraw-Hill.

Hoffer, J. A, George, J. F., & Valacich, J. S. (2002). *Modern Systems Analysis and Design.* New Jersey: Pearson Education, Inc.

Hossein, B. (2012). *Management Information system.* Singapore: Cengage Learning Asia.

Reynolds, G. W. (2010). *Information Technology Management.* Singapore: Cengage Learning Asia Pte.Ltd.

Robbins, S. P. & Coutler M. *Introduction to Management.* 9th ed. Singapore: Prentice Hall.

Schermerhorn, J. R. Jr. (2008). *Management.* 9th ed. USA: John Wiley & Sons.

Schwalbe, K. 92007). *Information Technology Project Management.* 4th ed. Singapore. Course Technology, Thomson Learning Asia.

Stair, R. & Reynods, G. (2009). *Fundamentals of Information Systems.* 3rd ed. Singapore. Thomson Course Technology.

B. **E-BOOKS**

Dennis, A, Wixom, B. H., & Roth, R. M. (2012). *Systems Analysis & Design*. 5th ed. USA: John Wiley & Sons.

Kerzner, H. (2009). *Project Management: A Systems Approach to Planning, Scheduling, and Controlling.* 10th ed. New Jersey. John Wiley & Sons, Inc.

Laudon, K. C. & Laudon, J. P. (2012). *Management Information Systems: Managing the digital firm.* 12th ed. New Jersey. Prentice Hall.

O'Brien, J. A. & Marakas, G. M. (2011). *Management Information Systems.* 10th ed. New York: McGraw-Hill/Irwin.

Schwalbe, K. (2011). *Information Technology Project Management.* 6th ed. Boston, USA: Course Technology, Cengage Learning.

Stair, Reynolds, Aldcorn & Neufeld (2012). *Principles of Information Systems: a managerial approach* USA: Nelson Education Ltd.

C. ELECTRONIC JOURNALS

Al-Ahmad, W. & Al-Oqaili, A. (2013). Towards a unified model for successful implementation of outsourcing and reversibility of information systems. J*ournal of King Saud University- Computer and Information Sciences* 25, 230. Retrieved November 20, 2015, from http://www.sciencedirect.com/science/article/pii/S1319157813000098

Alrawashdeh, Muhairat, & Althunibat (2013). Evaluating the Quality of Software in ERP Systems Using the ISO 9126 Model. *International Journal of Ambient Systems and Applications* (IJASA, 1(1), 1-7. Retrieved October 14, 2015, from http://www.zuj.edu.jo/wp-content/uploads/2014/05/0313asa01.pdf

Arshad, N. H., Lin, Y. M, & Mohamed, A. (2007). ICT outsourcing inherent risks, issues and challenges. *WSEAS Transactions on Business and Economics,* 8(4), 122-124. Retrieved October 14, 2015, from http://www.wseas.us/e-library/transactions/economics/2007/24-107.pdf

Belcourt, M. (2006). Outsourcing- the benefits and the risks. *Human Resource Management Review.* 19, 270. Retrieved September 2, 2015, from http://parsproje.com/tarjome/modiriyat/33.pdfURL

Brcar, F. & Bukovec, B. (2013). Analysis of Increased Information Technology Outsourcing Factors. *Organizacija,* 46(1), 13.

Caipang, C. L. A. (2013). Development of a computerized enrolment system in a rural-based higher education system. *Academic Research International,* 4(3), 143. Retrieved December 04, 2015, from http://www.savap.org.pk/journals/ARInt/Vol.4(3)/2013(4.3-15).pdf

Chen, S. C., Li, S. H., & Li, C. Y. (2011). Recent related research in Technology Acceptance Model: a literature review. *Australian Journal of Business and*

Management Research, 1(9), 125. Retrieved September 22, 2015, from http://www.ajbmr.com/articlepdf?AJBMR_19_04i1n9a14.pdf

Correia dos Santos, J. & Mira da Silva, M. (2012). Cost management in IT outsourcing contracts: the path to standardization. *Journal of Outsourcing & Organizational Information Management.* DOI: 10.5171/2012.948731. Retrieved April 3, 2016, from http://www.ibimapublishing.com/journals/JOOIM/jooim.html

Daneshgar, F., Worasinchai, L., & Low, G. (2011). An investigation of 'build vs. Buy' decision for software acquisition by small to medium enterprises *Social Science Research Network.* Retrieved October 14, 2015, from http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1867839

Dhar, S. & Balakrishnan, B. (2006). Risks, Benefits, and *Challenges in Global IT Outsourcing: Perspectives and Practices. Journal of Global Information Management,* 14(3),41. Retrieved September 16, 2015, from https://www.researchgate.net/publication/220500331_Risks_Benefits_and_Challenges_in_Global_IT_Outsourcing_Perspectives_and_Pactices

Doraisanny, M, Ibrahim, S., & Mahrin, N. (2014). The Need for Software Project Monitoring Methodology: An Exploratory Survey at malaysian Public Sector. *International Journal of Innovative Computing,* 4(1), 17. Retrieved July 31, 2015, from http://se.fsks.utm.my/ijic.index.php/ijic/article/viewFile/78/30

Fahmy, S., Haslinda, N., Roslina W., & Fariha Z. (2012). Evaluating the Quality of Software in e-Book Using the ISO 9126 Model *International Journal of Control and Automation,* 5(2), 115-119. retrieved October 14, 2015, from http://www.sersc.org/journals/IJCA/vol5_no2/14.pdf

Garcia, Vicente, & Aragones (2013). Maturity Model for IT Service Outsourcing in Higher Education Institutions. *International Journal of Advanced Computer Science and Applications,* 4(10), 40. Retrieved October 14, 2015, from https://arxiv.org/ftp/arxiv/papers/1312/1312.2868.pdf

Herath, T. & Kishore, R. (2009). Offshore outsourcing: risks, challenges, and potential solutions. *Information Systems Management,* 26(4), 317. DOI: 10.1080/10580530903245549. Retrieved November 21, 2015, from http://dx.doi.org/10.1080/10580530903245549

Kalaivani S. & Kavitha S. (2015). Comparative study on software project management models. *International Research Journal of Engineering and Technology (IRJET)* 2(4). Retrieved October 24, 2016, from https://www.irjet.net/archives/V2/i4/Irjet-v2i4169.pdf.

Khidzir, N. Z, Mohamed, A., & Arshad, N.H. (2013). ICT outsourcing information security risk factors: an exploratory analysis of threat risks factors for critical project characteristics. *Journal of Industrial and Intelligent Information,* 194), 220. Retrieved April 05, 2016, from http://www.jiii.org/uploadfile/2013/1012/20131012032701315.pdf

Kim, D. R., Cheon, M. C., Beugre, & Coveradale, C. D. (2003). Information systemsoutsourcing: exploration on the impact of outsourcing service providers service quality. *IACIS,* 529. Retrieved November 20, 2015, from https://www.researchgate.net/publication/255611341_INFORMATION_SYSTEM_OUTSOURCING_EXPLORATION_ON_THE_IMPACT_OF_OUTSOURCING_SERVICE_PROVIDERS'_SERVICE_QUALITY

Krisnaveni, R. & Meenakumari, J. (2010). Usage of ICT for Information Administration in Higher education institutions- A study. *International Journal of Environmental Science and Development,* 193), 282-284. Retrieved October 13, 2015, from http://www.ijesd.org/papers/55-D461.pdf

McManus, D. J. (2003). A Model of Organizational innovation: Build versus Buy in the Decision Stage. *The International Journal of Applied Management and Technology,* 1(1). Retrieved April 02, 2016, from http://citesserx.ist.psu.edu/viewdoc/download?doi=10.1.1.200.1451&rep=rep1&type=pdf

Mehta, D. & Kasnia, S. (2011). A scenario on the role of ICT in governance and education System. I*nternational Journal of Computational Engineering & Management,* 13, 100. file://C:/Users/Desktop/Downloads/A%20Scenario%20on%20the%20role%20of%20ICT%20in%20Governance%20And%20Education%20System%20(1).pdf

Mercado, C., Domantay, R, Villacillo, R, Nisperos, SS., & Pimentel, E. (2012). ICT Maturity of HEIs in Selected Regions in the Philippines. *International Journal of Modern Education Forum (IJMEF),* 1(1), 4. Retrieved October 02, 2015, from file:///C:/Users/Desktop/Downloads/IJMEF015%20(1).pdf

Milecova, M., Grznar M., & szabo, L. (2010). Outsourcing: Decision making in the case of outsourcing the company activity and the management of outsourcing project. *AGRIC.ECON. - CZECH,* 56(8), 388 & 391. Retrieved April 02, 2016, from http://www.agriculturejournals.cz/publicFiles/25302.pdf

Mushi, M. & bakari, J. (2012). Security in in-house developed information systems: *Systematics, Cybernatics and Informatics,* 10(2), 11-4. Retrieved December 10, 2015, from http://www.iiisci.org/journal/CV$/scipdfs/HFB762ZG.pdf

Nawi, H. S., Rahman, A. A., & Ibrahim O. (2012). Government ICT Project Failure Factors: Project Stakeholders' Views. *Journal of Research and Innovation in Information Systems,* 72. Retrieved September 16, 2015, from http://eprints.utm.my/30494/2/OthmanIbrahim2012_GovernmentICTProbjectFailureFactors.pdf

Nelson, R. (2012). IT Project Management infamous failures, classic mistakes, and best practices. *MIS Quarterly Executive,* 6(20, 75. Retrieved September 02, 2015, from http://www2.commence.virginia.edu/cmit/ResearchMISQE%206-07.pdf

Nikolic, B. & Dimitrijevic, L. R. (2009). Risk Assessment if Information TEchnology Systems. I*ssues in Informing Science and Information Technology,* 4, 595. Retrieved September 07, 2015, from http://iisit.org/Vol6/IISITv6p595-615Nikolic673.pdf

Oboegbulem, A. I. & Godwin, O. 92013). Application of ICT (Information and Communication Technology) in the management of universities in the North-Central State of Nigeria. *US-China Education Review A*, 3(93), 191. Retrieved September 08, 2015, from http://files.eric.ed.gov./fulltext/ED541641.pdf

Oliveira, T. & martins, M. F. (2011). Literature Review of Information Technology adoption Models at Firm Level. *The Electronic Journal Information Systems evaluation*, 14(1), 110. Retrieved September 22, 2015, from https://www.researchgate.net/publicaion/258821009_Literature_review_of_Information_Technology_Adoption_Models_at_Firm_Level

Prado, E. (2011). Risk analysis in Information Technology and communication outsourcing. *Journal of Information Systems and Technology Management,* 8(3), 608. Retrieved September 02, 2015, from http://www.scielo.br/pdf/jistm/v8n3/05.pdf

Sagitova, G. K. (2012). Management Information System for Higher Educational Institutions During Kazakhstan Transition to Knowledge

Economy. World Applied Sciences *Journal 18 (Special Issue of Economics),* 56. DOI: 10.5829/idosi wasj.2012.18.12009. Retrieved December 13, 2015, from http://www.idosi.org/wasj/wasj18(Economics)12/9.pdf

Shaikh, M. K. & Ahsan, K. (2015). Software project management in developing countries: landscape, literature review framework and opportunities. *Research Journal of Recent Sciences*, 4(1), 118. Retrieved March 21, 2016, from http://www.isca.in/rjrs/archive/v4/i1/18.ISCA-RJRS-2013-1125.pdf

Skoumpopoulou, D. & Nguyen-Newby, T. (2015). The organizational impact of implementing information system in higher education institutions: a case study from a UK university. *Wiley Online Library*, 463. doi 10.1002/jsc.2022. Retrieved March 2016, 201, from http://onlinelibrary.wiley.com/doi/10.1002/jsc.2022/epdf?r3_referrer=onlinelibrary.wiley.com&purchase_site-license=LICENSE_DENIED

Smuts, H. Kotze, P., & Merwe A. (2010). Information systems outsourcing issues in the communication technology sector. *ResearchGate.* Retrieved April 10, 2016, from https://www.researchgate.net/publication/45686764_Information_system_outsourcing_issues_in_the_Communication_technology_sector

Titthasiri, W. (2014). A Strategic Decision-Making Framework For E-Learning System: Based on Strategic Planning Process and ISO 9126 Model. *International Journal of Engineering Sciences & Research Technology,* 3(7), 590. Retrieved November 15, 2015, from https://www.academia.edu/7876904/A_Strategic_Decision-Making_Framework_For_E-Learning_System_Based_on_Strategic_Planning_Process_and_ISO_9126_Model

Yarlikas, S. (2010). An investigation about information systems of outsourcing and outsourcing decision. *International Journal of Business and Management Studies*, 2(2), 73. Retrieved November 20, 2015, from http://www.sobiad.org/ejournals/journal_IJBM/arhieves/2010_2/10serdar_yarlikas.pdf

D. CONFERENCE PAPER & PROCEEDINGS

Bakeer, A. & Wynn, M. G. (2014). *ICT Utilization in Libyan Universities: A Report on Case Study Research* Paper presented at The Ninth International Multi-Conference on Conference on Computing in the Global Information Technology. Retrieved September 14, 2015, from http://eprints.glos.ac.uk/2081/1/ICT%20Utilization%20in%20Libyan%20Universities.pdf

Chaushi, B. A, Chaushi, A, & Dika, Z. (27-29 May 2015). ICT for higher education: an outlook in the cost saving IT projects and information systems. *Conference paper presented at the Management, Knowledge and Learning and Technology, Innovation and Industrial Management Joint International Conference, Bari, Italy*. Retrieved September 17, 2015, from http://www.toknowpress.net/ISBN/978-961-6914-13-0/papers/ML15-345.pdf

Chua, B.B. & Dyson, L.E. (2004). Applying the ISO9126 model to the evaluation of an elearning system. In R Atkinson, C. McBeath, D. Jonas-Dwyer & R. Philip (Eds), *Beyond the comfort zone: Proceedings of the 21st ASCILITE Conference* (pp. 184-190). Perth, 5-8 December. Retrieved April 09, 2016, from http://www.ascilite.org.au/conferences/perth04/procs/chua.html

Daneshgar, F., Worasinchai, L., & Low, G. (June 19, 2011). An Investigation of 'Build vs. Buy' Decision for Software Acquisition in Small to Medium Enterprises. *Society of Interdisciplinary Business Research (SIBR) Conference on Interdisciplinary Business Research.* Available at SSRN: http://ssrn.com/abstract=1867839

Erek, K., Schmidt, N., Zarnekow, R, Kolbe, L. M. Sustainability in Information Systems: Assortment of Current Practices in IS Organizations" (2009). *AMCIS 2009 Proceedings.* Paper 123. Retrieved April 03, 2016, from http://aisel.aisnet.org/amcis2009/123

Kahveci, T. C., Uygun, O., Yurtsever, U., & Ilyas, S. (2012). Quality assurance in higher education institutions using strategic information system. *Paper presented at the International Conference on New Horizons in Education INTE2012.* Retrieved December 13, 2015, from http://ac.els-cdn.com/S1877042812039523/1-s2.0-S1877042812039523-

main.pdf?_tid=8ab7cdc-7868-11e6-ac45-00000aabOf26&acdnat+1473630288_e62222ab6f8d9496a6903e5931fae12

Hua, H. & Herstein, J. (march 2003). Education Management Information System (EMIS): Integrated Data and Information Systems and Their Implications In Educational Management. *Paper Presented at the Annual Conference of Comparative and International Education Society New Orleans, LA, USA.*

Meng, F. J., He, X Y., Yang, S. X, & Ji, P. A Unified Framework for Outsourcing Governance. *Paper presented at the 9th IEEE International Conference on E-Commerce Technology and The 4th IEEEE International Conference on Enterprise Computing, E-Commerce and E-Services.*

Sena, M. & Sena, J. (2010). Make or Buy: A comparative assessment of organizations that develop software internally versus those that purchase software. *Paper presented at the Conference on Information Systems Applied Research, Nashville Tennessee, USA*. Retrieved July 31, 2015, from http://proc.conisar.org/2010/pdf/1514.pdf

Phahlane, M. & Kekwaletswe, R. (2014, March). *Management informations systems use in higher education environments.* Paper presented at the *Southern Association for Information Systems Conference, Macon, GA, USA March* Retrieved December 26, 2015, from http://aisel.aisnet.org/cgi/viewcontent.cgi?article=1028&context=sais2014

Zornada, L. & Velkavrh, T. B. (20-23 June 2015). Implementing ERP Systems in Higher Education Institutions. Paper presented at the 27th Int. Conf.

Information Technology Interfaces ITI 2005, Cavtat, Croatia. Retrieved August 17, 2015, from http://www.uprm.edu/cti/docs/patsi/DeploymentStudy/01491143.pdf

E. UNPUBLISHED MATERIALS

Owoseni, A. O. & Imhanyehor, G. J. *"User Involvement in In-House Developed Software,"* Unpublished Master's Thesis, School of Computing, Blekinge Institute of Technology. June 2011. Retrieved January 3, 2016, from http://www.diva-portal.org/smash/get/diva2:831012/FULLTEXT01.pdf

F. WEBPAGE AND OTHER ELECTONIC SOURCES

Cincom (2008). To Build or Buy? A Question of Application Development for Compliance and Quality Systems. White Paper. USA. Retrieved March 16, 2015, from https://www.yumpu.com/en/document/view/30726792/to-build-or-buy-cincom/3

Clydebuilt Business Solutions Ltd. (May 2012). *Developing in-house vs. Off-the-shelf* Retrieved October 15, 2015, from www.clydebuiltsolutions.com/wp…/Inhouse-VS-Off-the-Shelf-May.pdf

Cognizant (2013). Technology Cost Management 4D Framework: A Smarter Way to Manage IT Costs. Retrieved November 30, 2015, from https://www.utwente.nl/ctw/cme/about_the_group/annual_reports/2012_annual_reportpdf

Engineering Statistics Handbook (2013). Retrieved October 9, 2016, from http://www.itl.nist.gov/div898/handbook/pmd/section4/pmd41.htmhttp://www.itl.nist.gov/div898/handbook/pmd/section4/pmd41.htm

ITS Project Management Methodology. Information Technology Services Project Management Group. 11/17/2014

Legislative Assembly of the Northern Territory (May 2014). Management of ICT Projects by Government Agencies. Retrieved August 16, 2015, from http://www.nt.gov.au/lant/parliamentary-business/committees/public%20accounts/PAC_Report_ICT_Inquiry_Management_in_the_Northern_Territory_Government.pdf

Marion, G. (2008). An Introduction to Mathematical Modeling. Retrieved January 15, 2017, from https://people.maths.bris.ac.uk/-madjl/course_text.pdf

Rahardjo, E. (2006). D*ecision making in Information Technology acquisition: A system analysis approach.* Retrieved March 21, 2015, from http://www.umsl.edu/-sauterv/analysis/f06Papers/Rhardjo/

Ruchkin, I. (May 9, 2012). Building Software In-House: Too Much Control and Flexibility. Institute for Software research, Carnegie Mellon University. Retrieved November 29, 2016, from http://citeseerx.ist.psu.edu/viewdoc/download,jsessionid=1222560EDF809E453A9E2A092C0A98ADA?doi=10.1.1.300.4229&rep=rep1&type=pdf

Setende, H. (2012). *Differences, advantages and disadvantages between in-house development IT systems and industry standard ERP system.* Retrieved April 3, 2015, from http://www.academia.edu/4865003/Differences_advantages_and_disadvantages_between_in-house_development_IT_systems_and_Industry_standard_ERP_system

Wagner, D.A., Day, B., James, T., Kozma, R. B., Miller, J., & Unwin, T. (2005). Monitoring & evaluation of ICT in education projects. *Information for Development Program.* Retrieved October 28, 2015, from http://www.infodev.org/infodev-files/resource/InfrodevDocuments_9.pdf

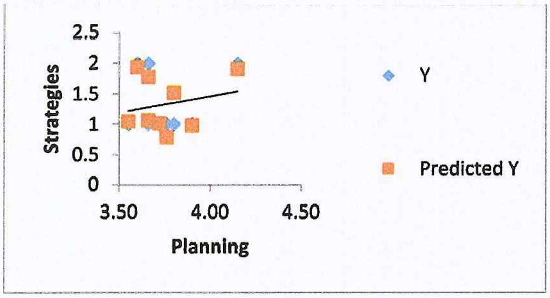
Yanosky, R. & Caruso, J. B. (2008). Processes and politics: IT governance in Higher Education. *Educause Center for Applied Research, 1.* Retrieved May 1, 2016, from http://web.ccsu.edu/itc/Governance_KeyFindings.pdf?redirected

G. OTHERS

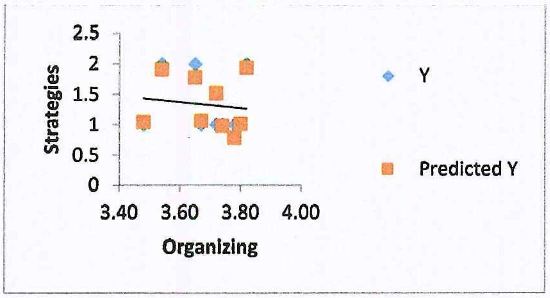
CHED Memorandum Order No. 46, series 2012. *"Policy-Standard to Enhance Quality Assurance (QA) in the Philippine Higher Education through Outcomes-Based and Typology-Based QA"* Retrieved April 30, 2016, from http://www.ched.gov.ph/wp-content/uploads/2013/07/CMO-No.46-s2012.pdf

APPENDICES

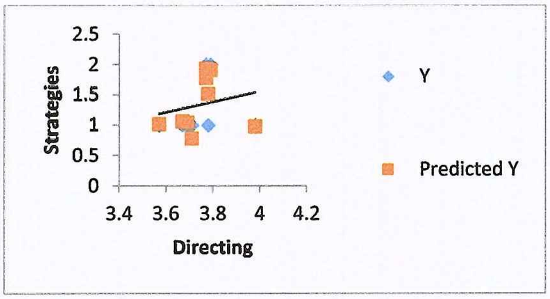
APPENDIX A



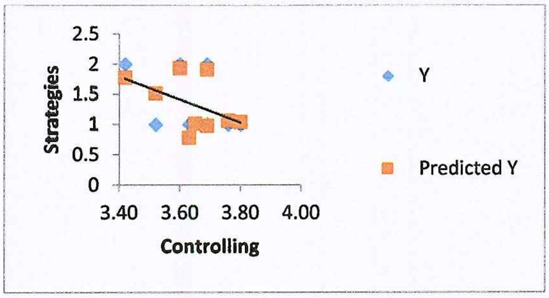
(a)



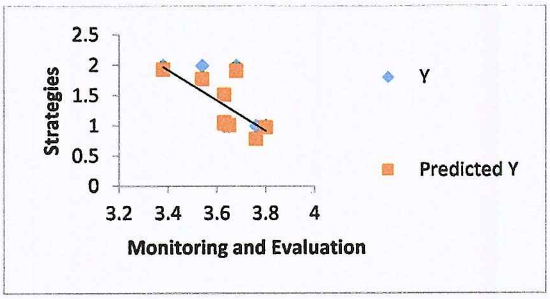
(b)



(c)

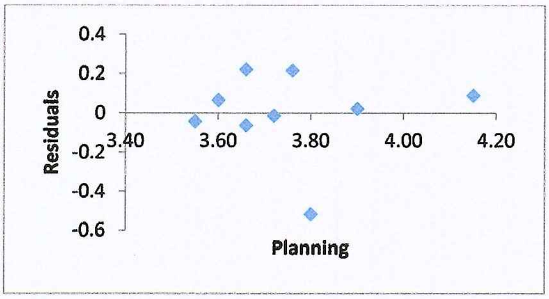


(d)

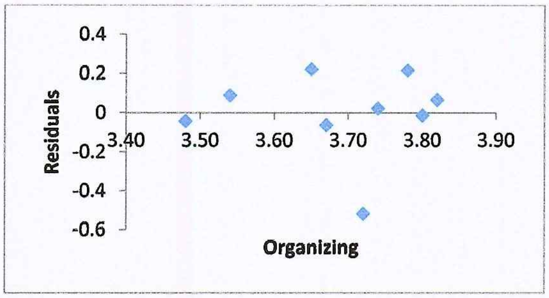


(e)

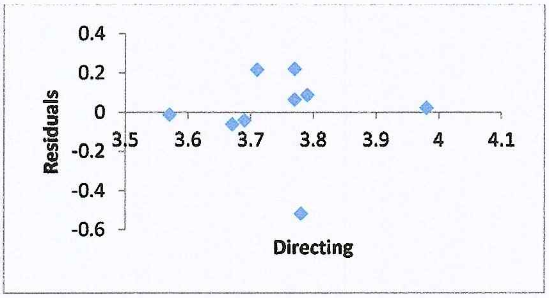
Figure 33. Line Fit Plot of the Model on Management Strategies



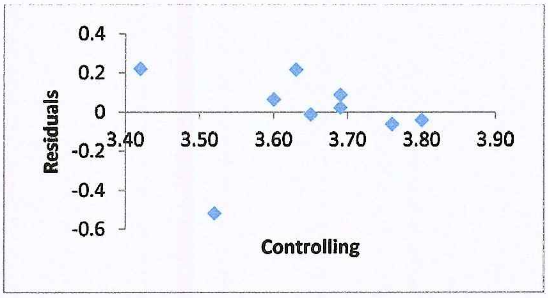
(a)



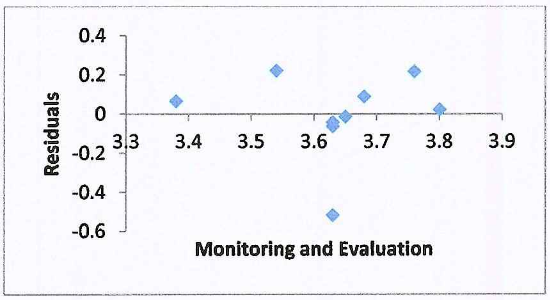
(b)



(c)



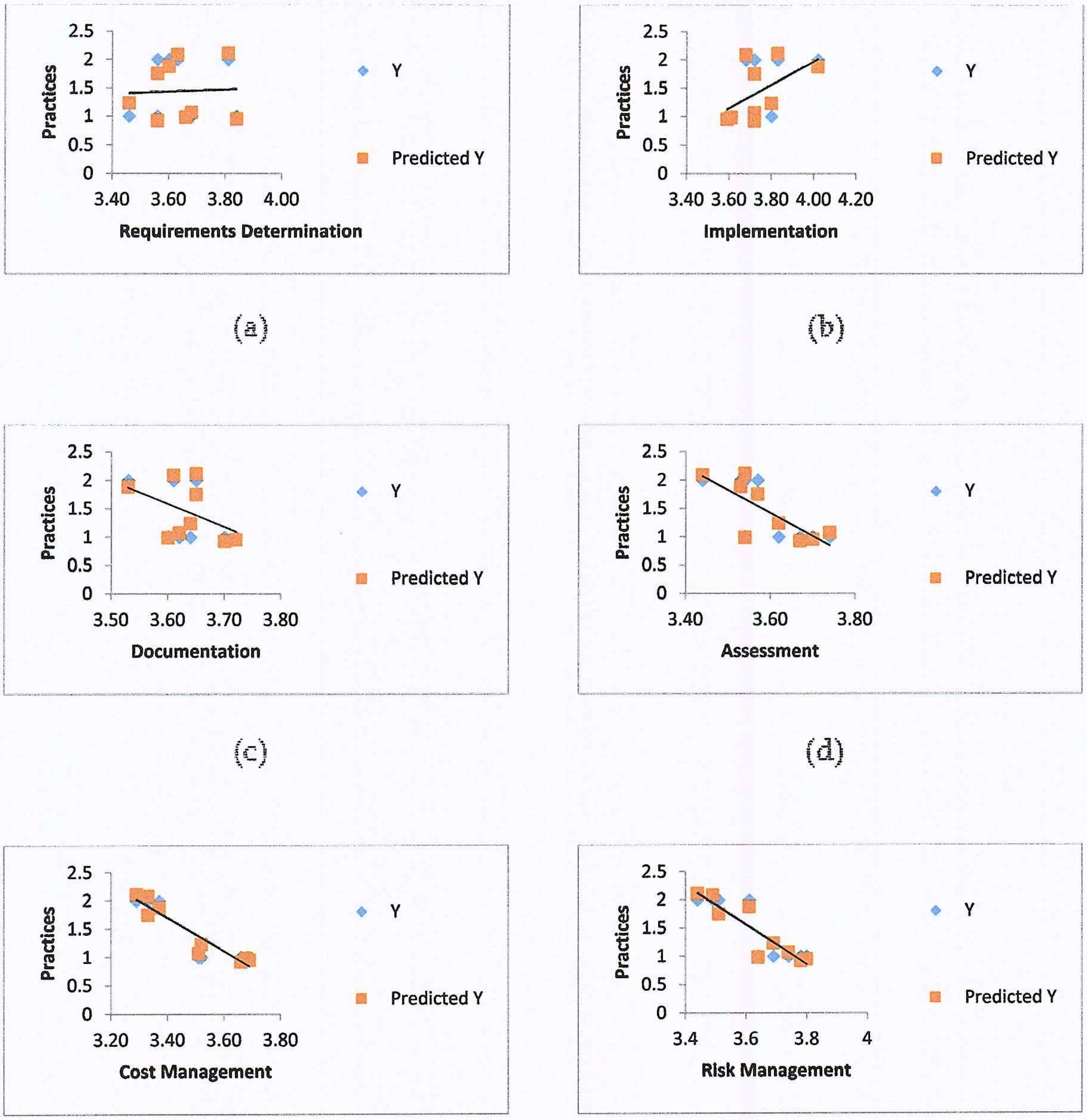
(d)



(e)

Figure 34. Residual Plot of the Model on Management Strategies

APPENDIX B



(a) (b) (c) (d) (e) (f)

Figure 35. Line Fit Plot of the Model on Practices

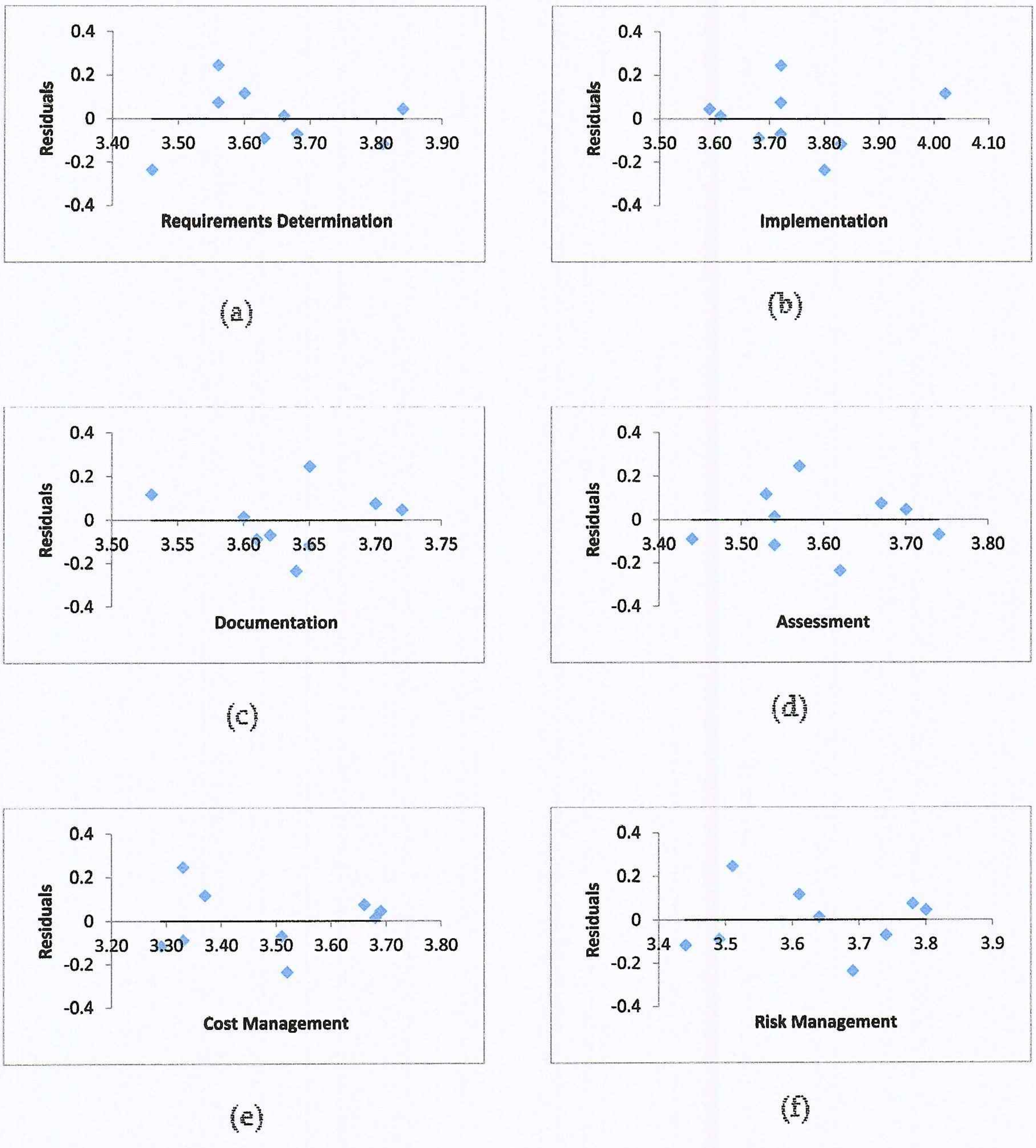


Figure 36. Residual Plot of the Model on Practices

APPENDIX C

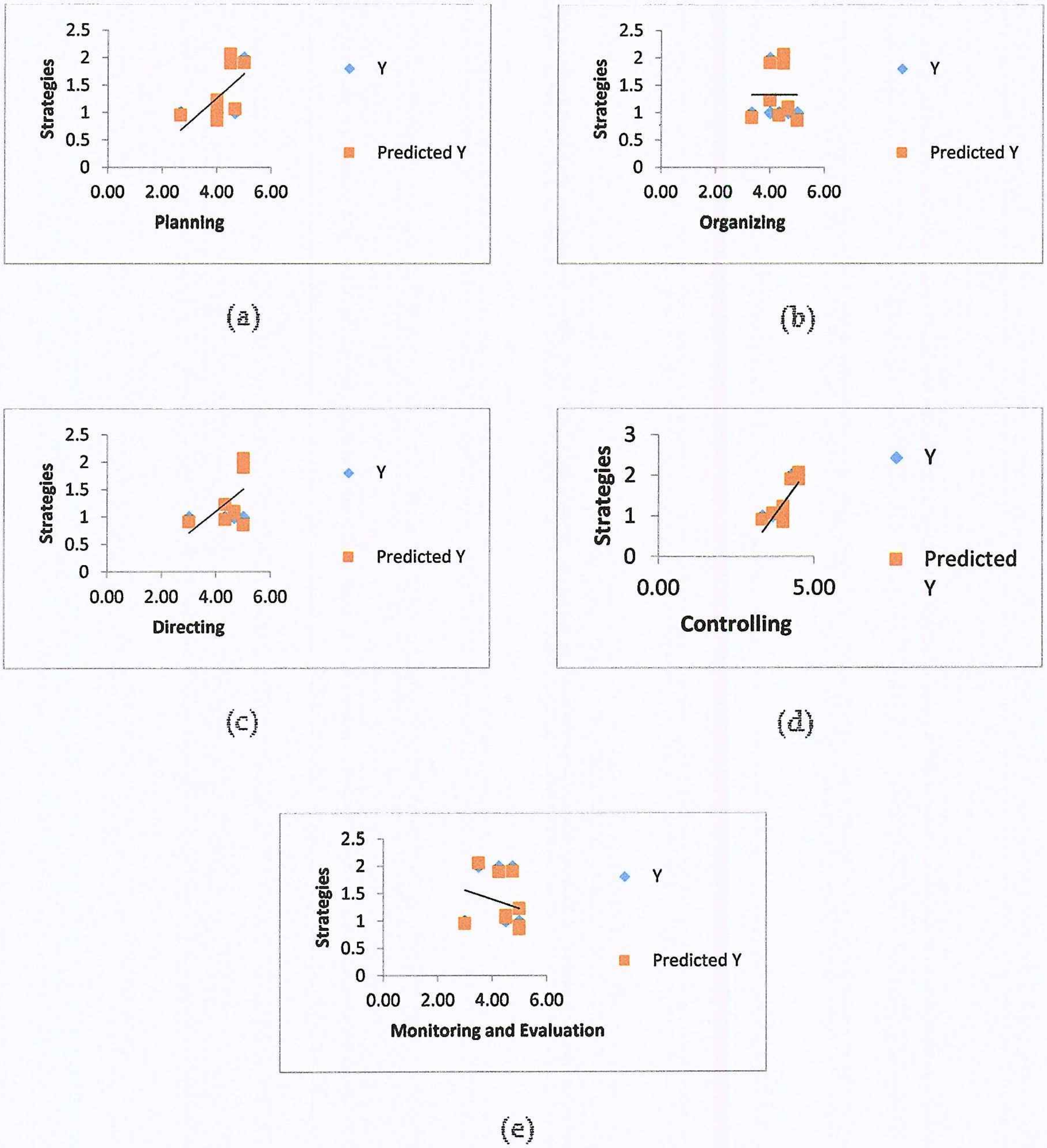


Figure 37. Line Fit Plot of the Model for HEI 1 on Management Strategies.

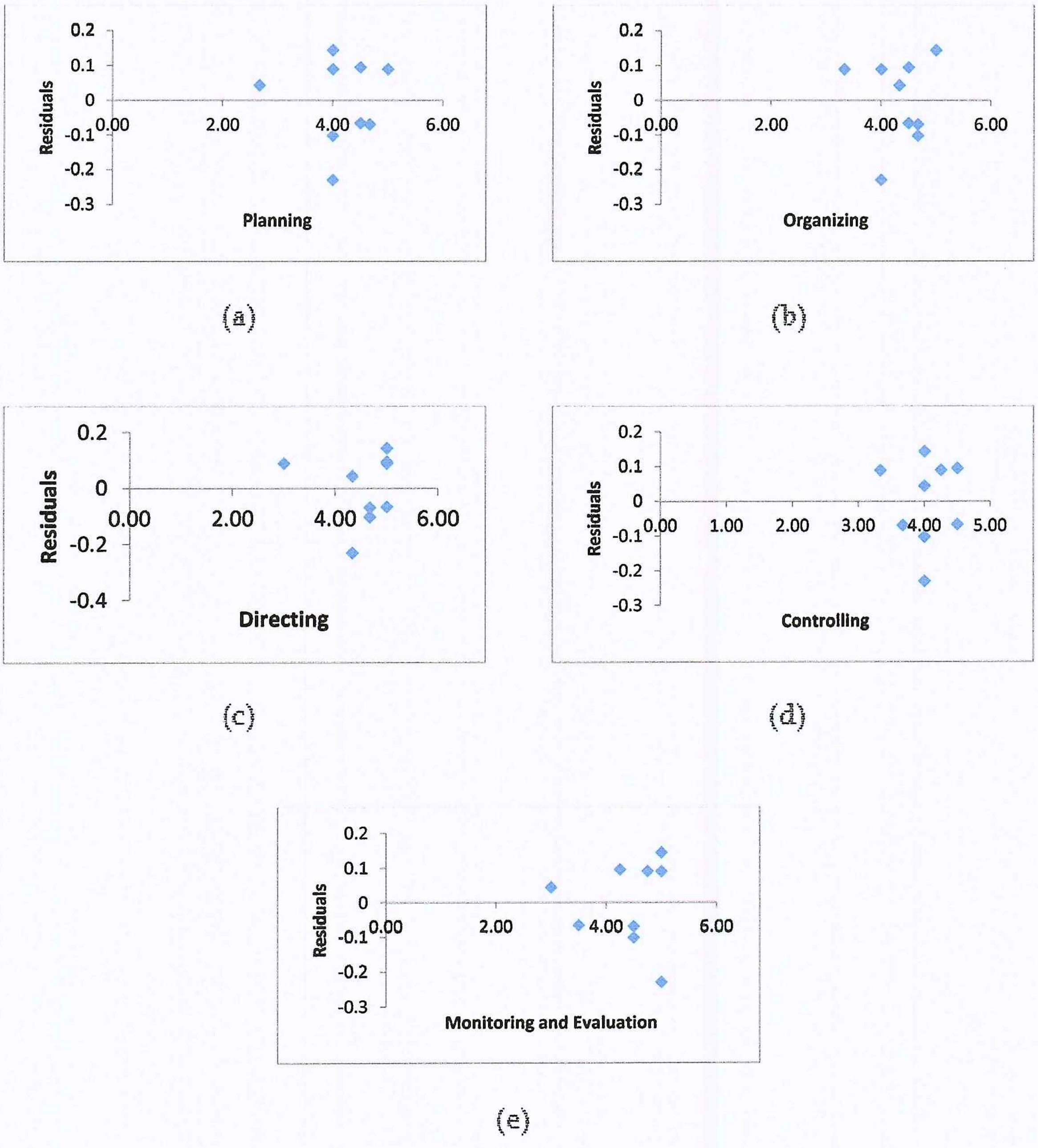
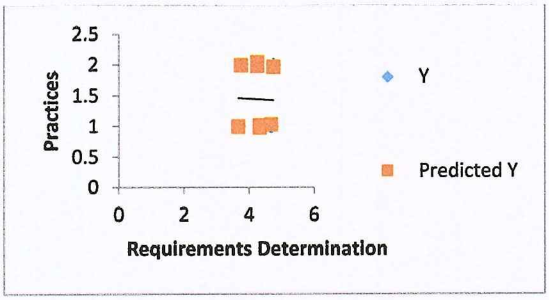
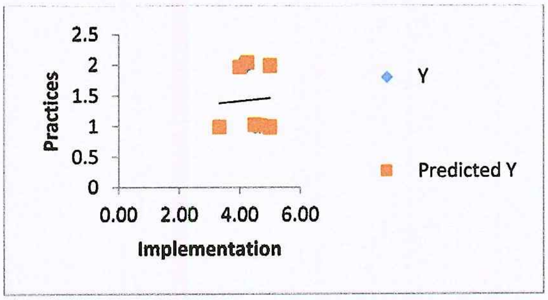


Figure 38. Residual Plot of the Model for HEI 1 on Management Strategies

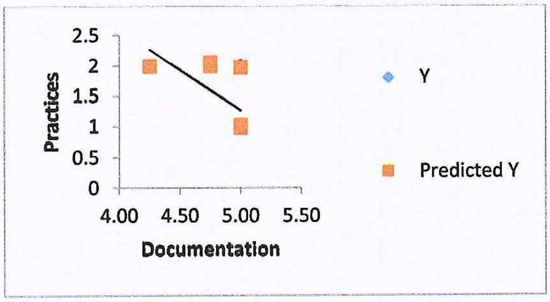
APPENDIX D



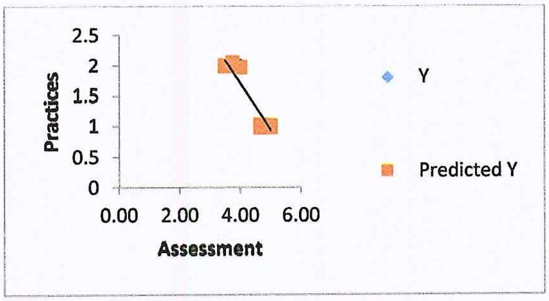
(a)



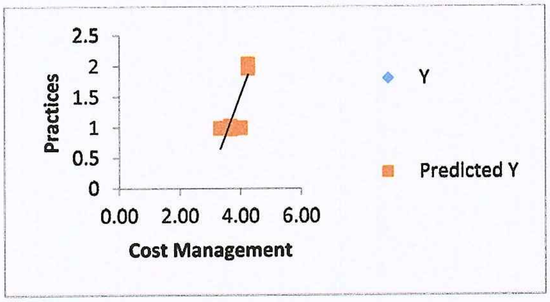
(b)



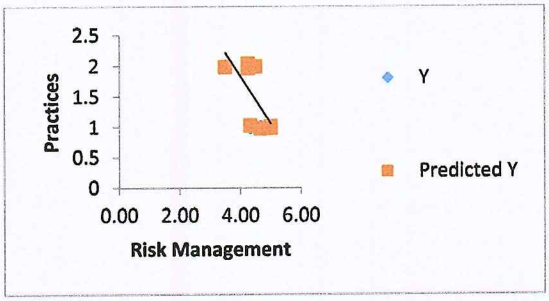
(c)



(d)

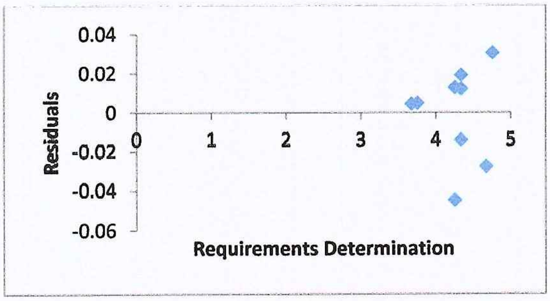


(e)

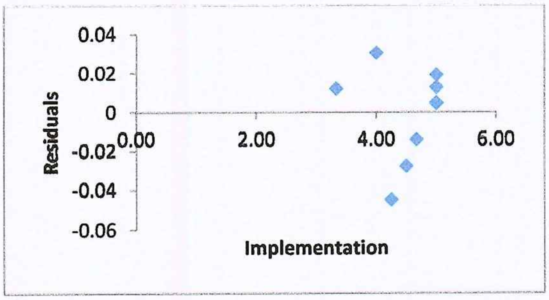


(f)

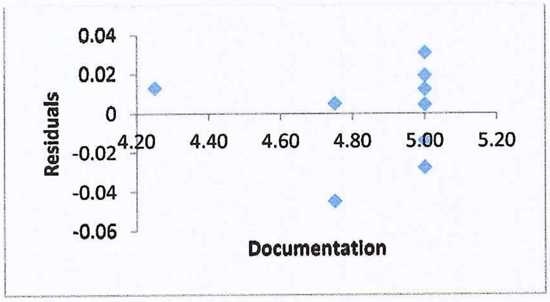
Figure 39. Line Fit Plot of the Model for HEI 1 on Practices



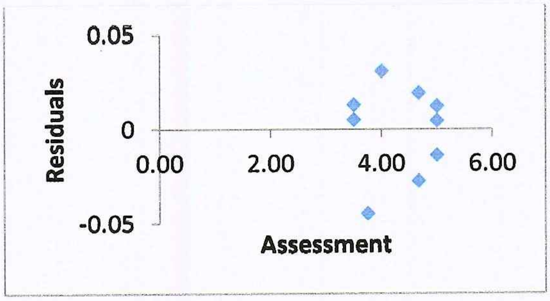
(a)



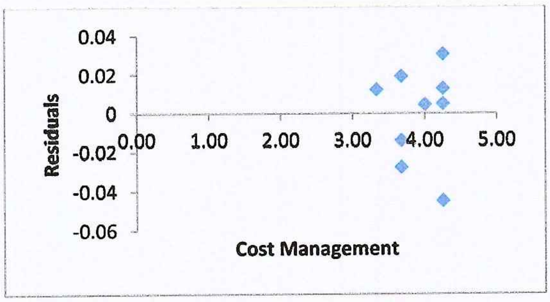
(b)



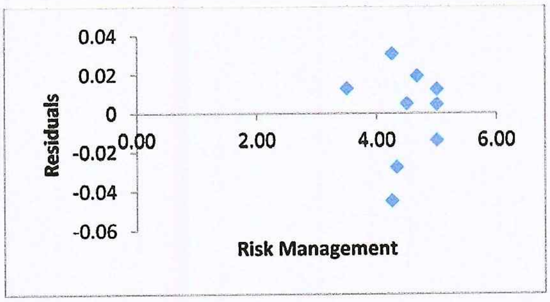
(c)



(d)



(e)



(f)

Figure 40. Residual Plot of the Model for HEI 1 on Practices

APPENDIX E

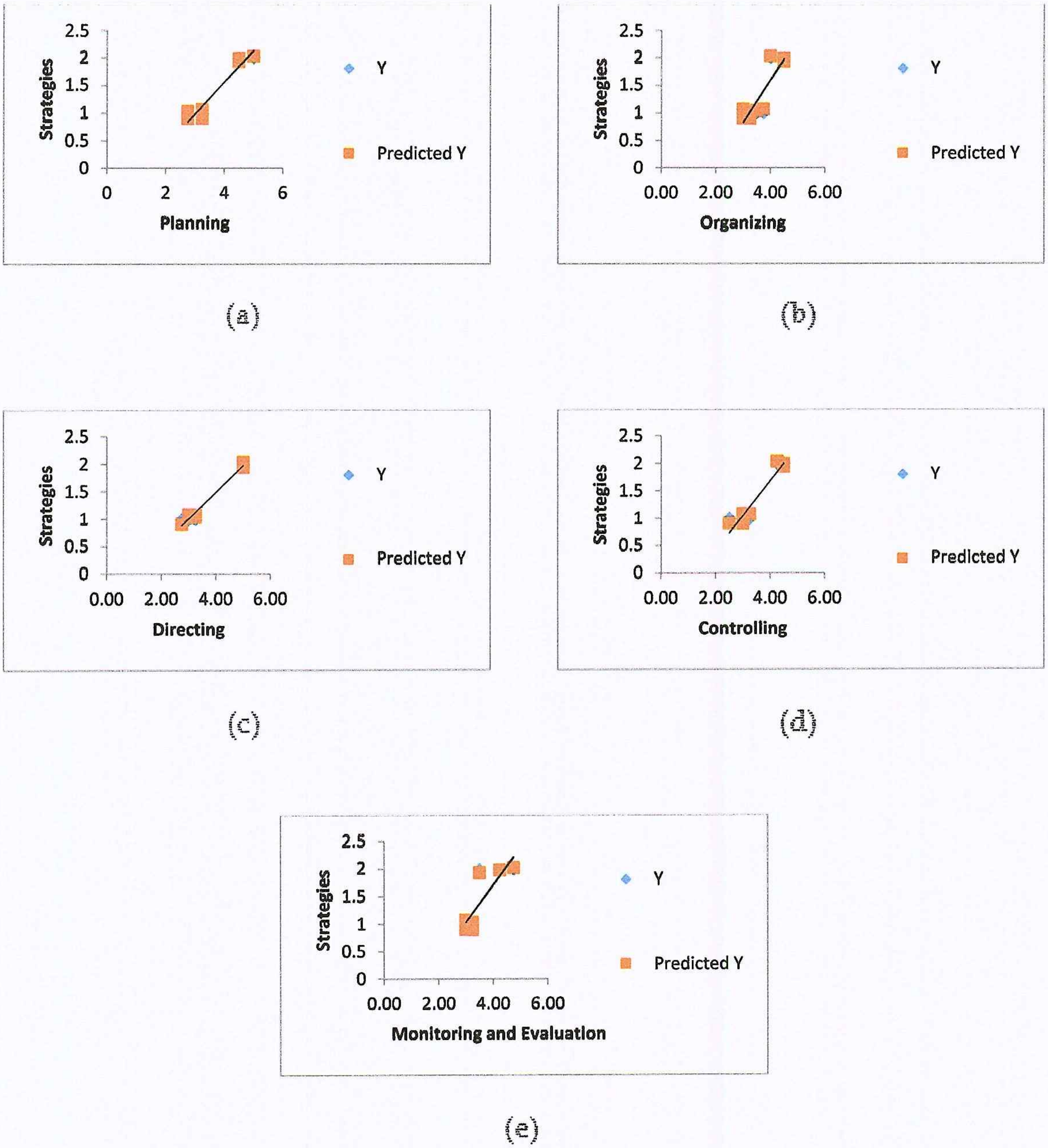
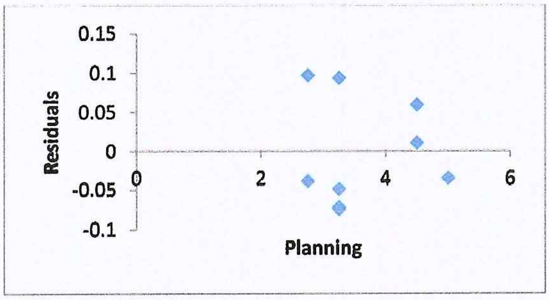
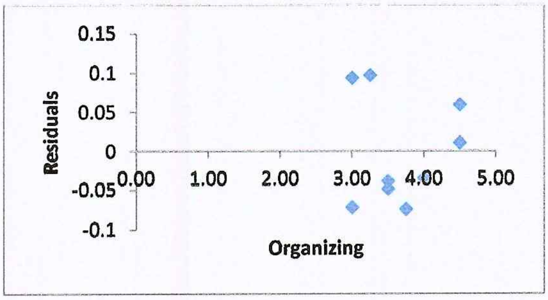


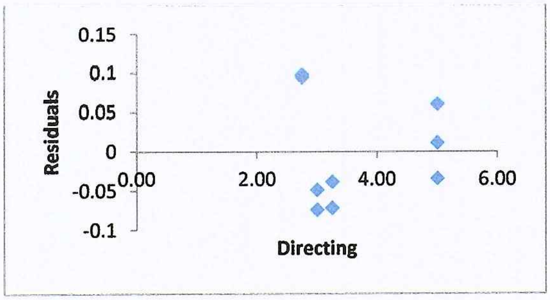
Figure 41. Line Fit Plot of the Model for HEI 2 on Management Strategies



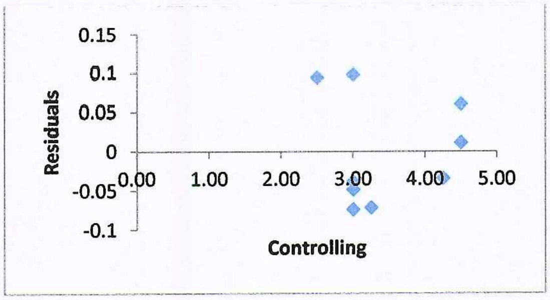
(a)



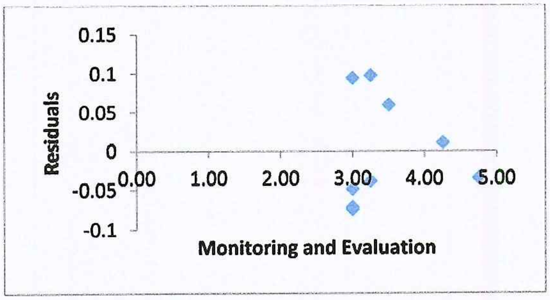
(b)



(c)



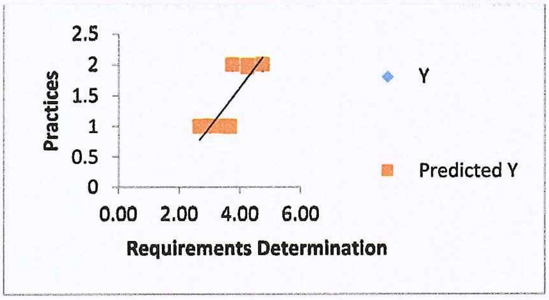
(d)



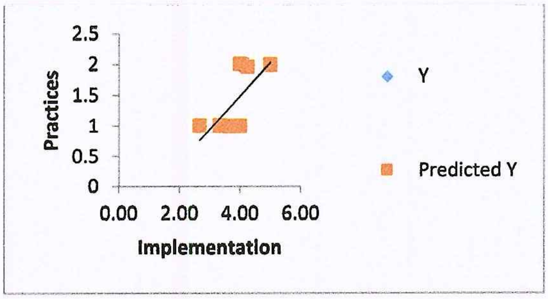
(e)

Figure 42. Residual Plot of the Model for HEI 2 on Management Strategies

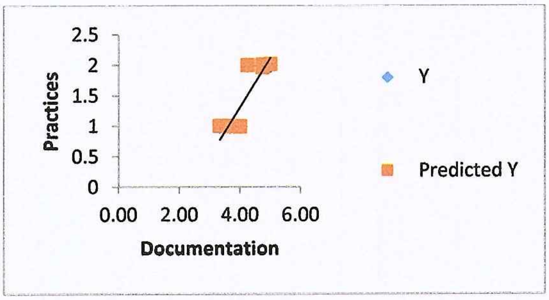
APPENDIX F



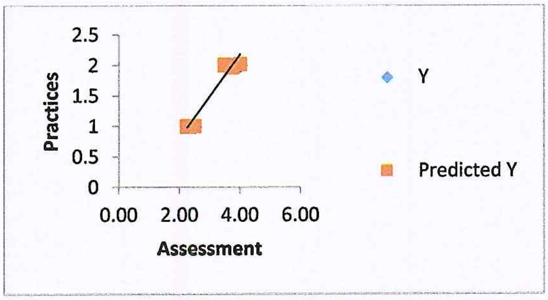
(a)



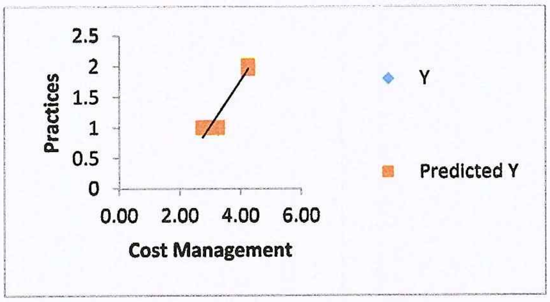
(b)



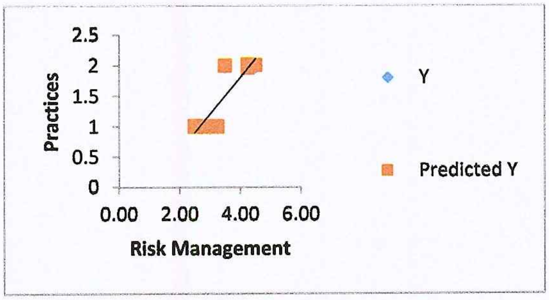
(c)



(d)

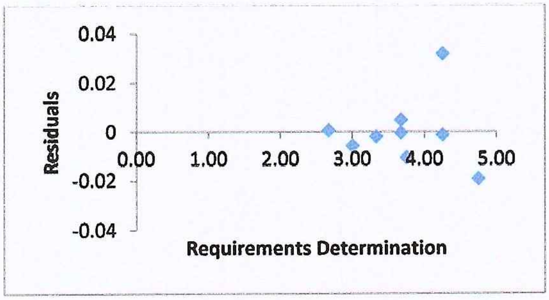


(e)

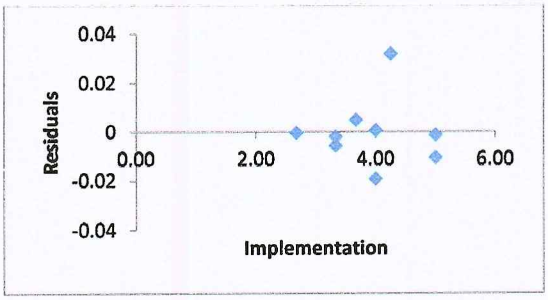


(f)

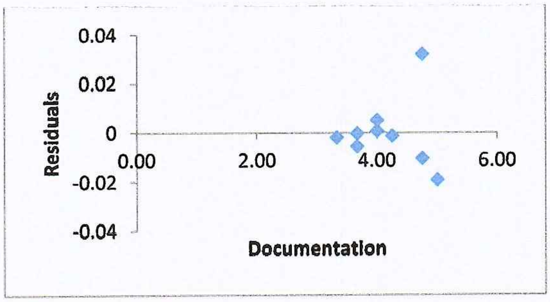
Figure 43. Line Fit Plot of the Model for HEI on Practices



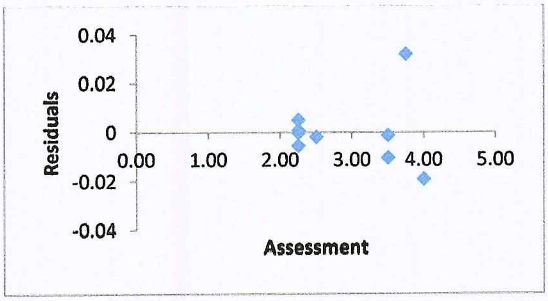
(a)



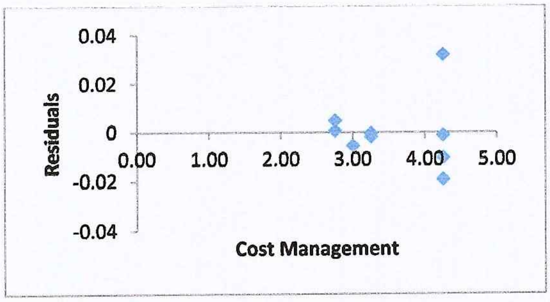
(b)



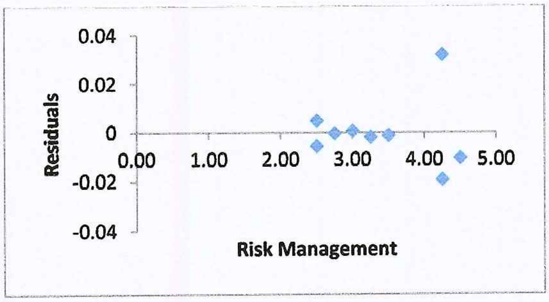
(c)



(d)



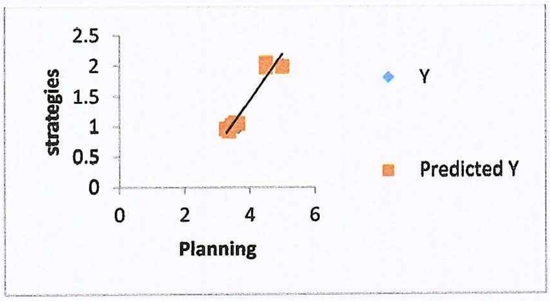
(e)



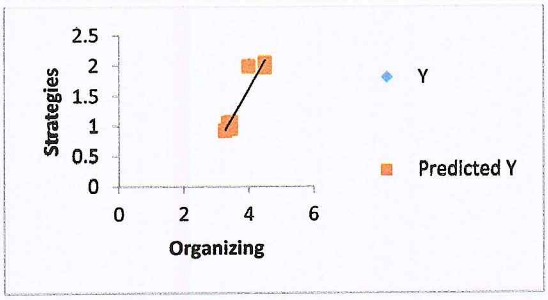
(f)

Figure 44. Residual Plot of the Model for HEI 2 on Practices

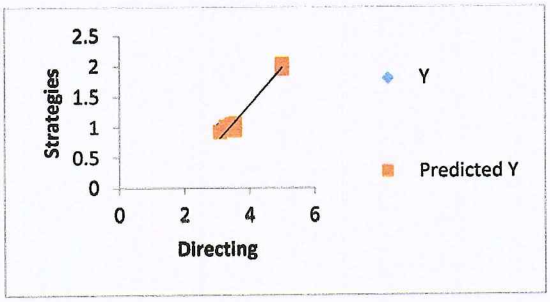
APPENDIX G



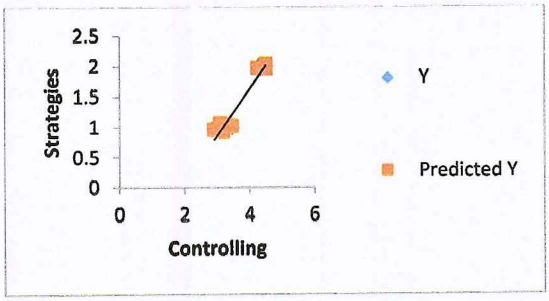
(a)



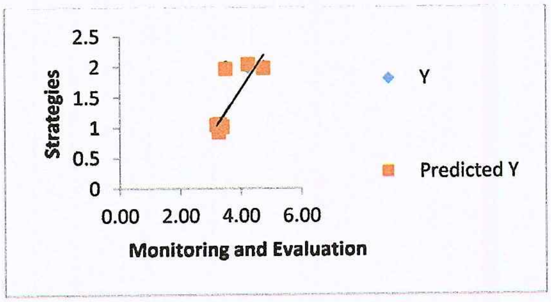
(b)



(c)

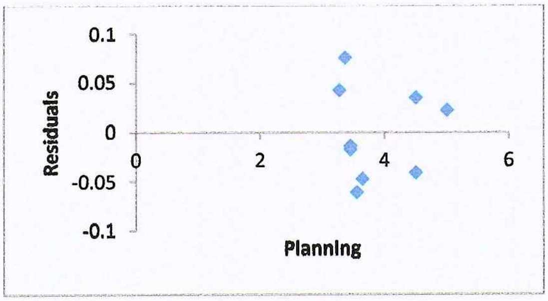


(d)

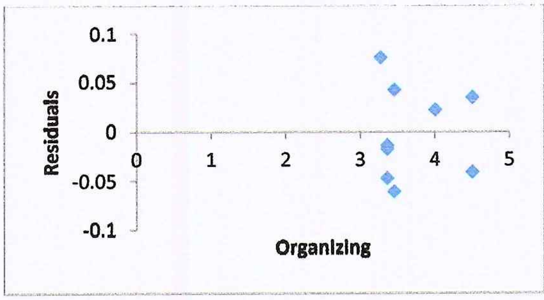


(e)

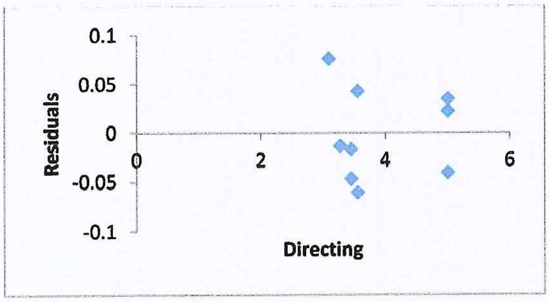
Figure 45. Line Fit Plot of the Model for HEI 3 on Management Strategies



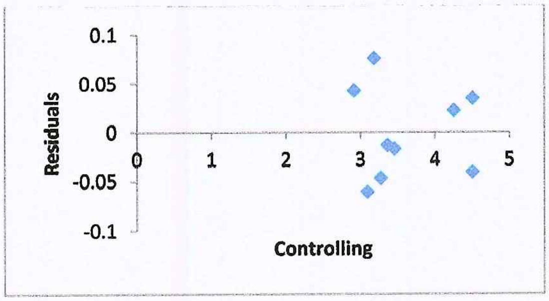
(a)



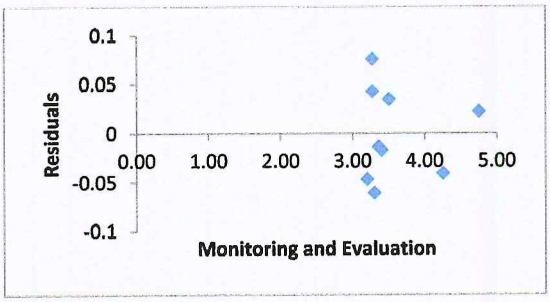
(b)



(c)



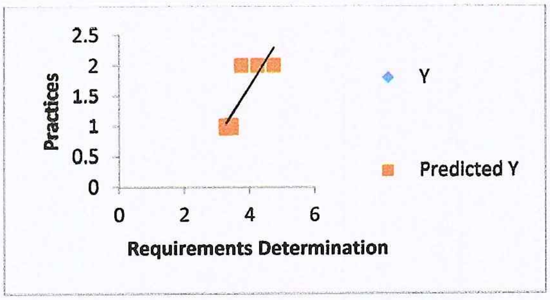
(d)



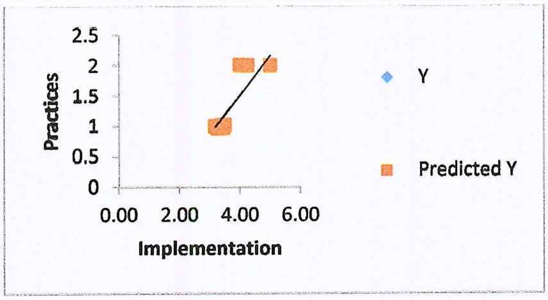
(e)

Figure 46. Residual Plot of the Model for HEI 3 on Management Strategies

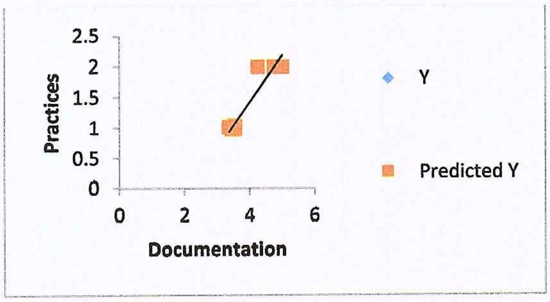
APPENDIX H



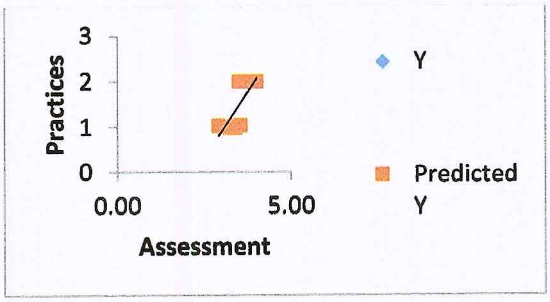
(a)



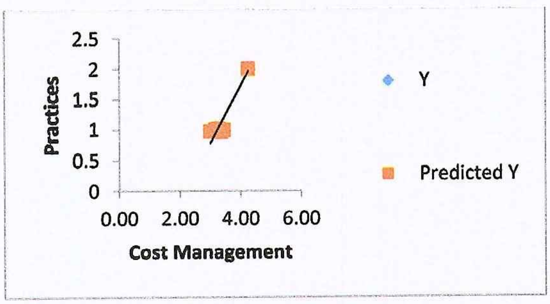
(b)



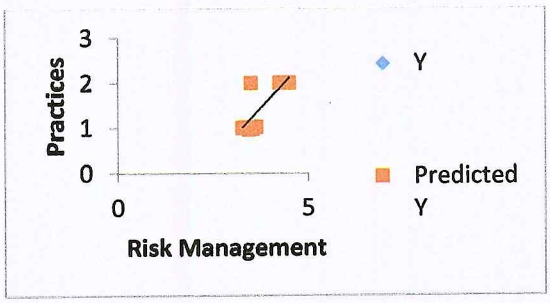
(c)



(d)



(e)



(f)

Figure 47. Line Fit Plot of the Model for HEI 3 on Practices

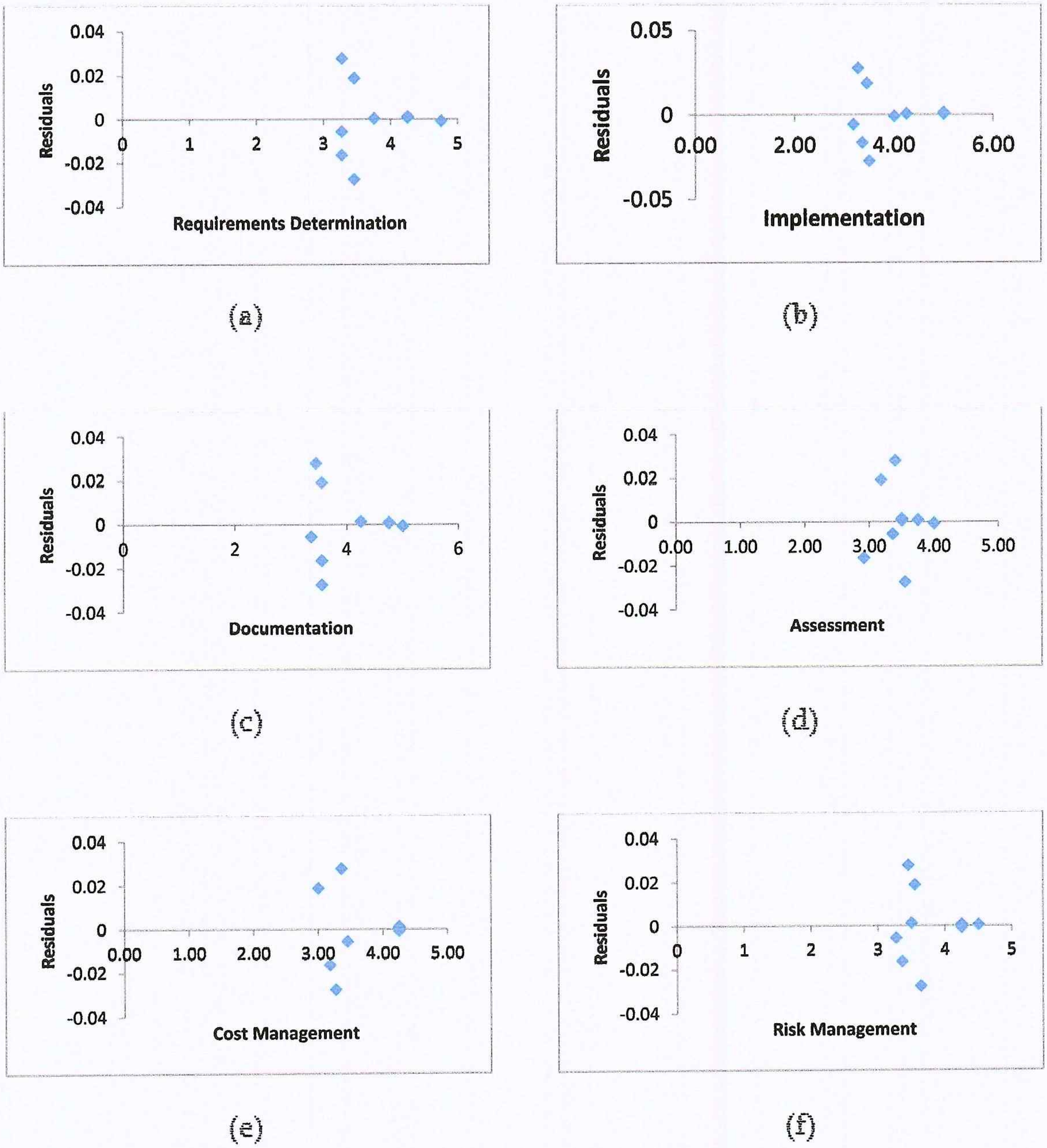


Figure 48. Residual Plot of the Model for HEI 3 on Practices

APPENDIX I

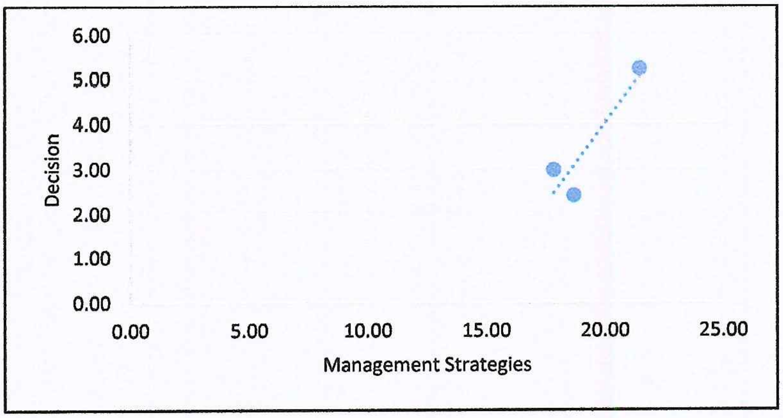


Figure 49. Line Fit Plot of the Model on Management Strategies for the 3 HEIs

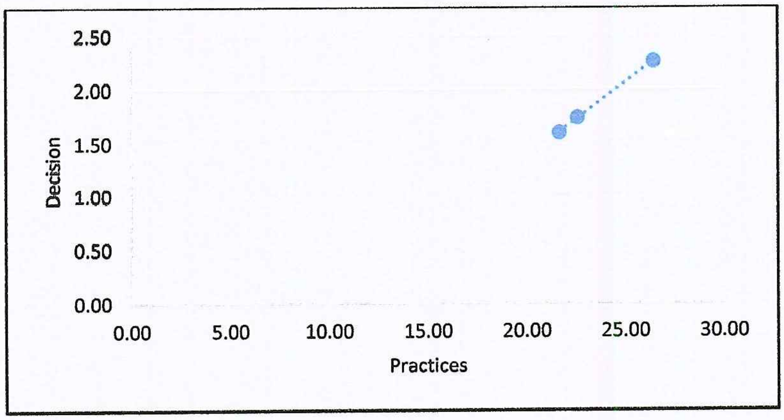


Figure 50. Line Fit Plot of the Model on Practices for the 3 HEIs

APPENDIX J

Republic of the Philippines
SAMAR STATE UNIVERSITY
COLLEGE OF GRADUATE STUDIES
Catbalogan City

February 14, 2015

DR. MARILYN D. CARDOSO
Vice President for Academic Affairs/
Dean, College of Graduate Studies
Samar State University
Catbalogan City

Madam:

I have the honor to submit the following titles for my Dissertation Writing.

It is my earnest desire to study one of these title for my Dissertation:

1. A Comparative Study of Outsourcing and In-House Information and Communication Technology (ICT) Projects of Higher Education Institutions in Samar

2. Utilization and Commercialization of Technological Innovations of State Universities and Colleges

3. Factors Affecting the Adoption the Adoption of Information and Communication Technology in the Tourism Industry in Samar

I hope for your favorable action regarding this matter.

Respectfully yours,

(Sgd) RODOLFO F. DOLLADO, JR.
Researcher

Approved:

(Sgd) MARILYN D. CARDOSO, Ph.D.
Vice President for Academic Affairs/
Dean, College of Graduate Studies

APPENDIX K

Republic of the Philippines
SAMAR STATE UNIVERSITY
COLLEGE OF GRADUATE STUDIES
Catbalogan City

February 14, 2015

TO:

Dr. Felisa E. Gomba
Dr. Jose S. Labro
Dr. Ronald L. Orale
Dr. Simon P. Babalcon, Jr.

May I ask you to be a member of the committee to evaluate the attached Dissertation title/s?

Please give your comments and suggestions which you will discuss with the proponent.

Thank you for your cooperation.

Very truly yours,

(Sgd.) MARILYN D. CARDOSO, Ph.D.
Dean, College of Graduate Studies

EVALUATION/RECOMMENDATIONS

APPENDIX L

Republic of the Philippines
SAMAR STATE UNIVERSITY
COLLEGE OF GRADUATE STUDIES
Catbalogan City

ASSIGMENT OF ADVISER

June 6, 2015

DR. FELISA E. GOMBA
Graduate School Faculty
This University
Catbalogan City

Madam:

Please be informed that you have been designated as adviser of **RODOLFO F. DOLLADO, JR.**, candidate for the degree in **Doctor of Philosophy major in Technology Management** who proposes to write a dissertation entitled **"OUTSOURCING AND IN-HOUSE DEVELOPMENT OF INFORMATION AND COMMUNICATION TECHNOLOGY (ICT) PROJECTS OF HIGHER EDUCATION INSTITUTIONS IN SAMAR."**

Thank you for your cooperation.

Very truly yours,

(Sgd.) MARILYN D. CARDOSO, Ph.D.
Dean, College of Graduate Studies/
Vice President for Academic Affairs

CONFORME:

(Sgd.) FELISA E. GOMBA, Ph.D.
Adviser

APPENDIX M

Republic of the Philippines
Office of the President
COMMISSION ON HIGHER EDUCATION
REGIONAL OFFICE NO. VIII

January 18, 2016

MR. RODOLFO F. DOLLADO, JR.
Researcher
Northwest Samar State University
Calbayog city
don_dollado2002@yahoo.com

Dear **Mr. Dollado:**

In reference to the communication received by this Office requesting for a List of Higher Education Institutions in the Provinces of Samar, Eastern Samar and Northern Samar, please find attached copy of the report per HEMIS data of this Office.

For your guidance.

Very truly yours,

Maura Consolacion D. Cristobal

MAURA CONSOLACION D. CRISTOBAL, Ed.D., CESO III
Director IV

CHEDRO VIII
RELEASED
01-19-16

Enc'l.: as stated

rll01182016

APPENDIX N

Republic of the Philippines
COMMISSION ON HIGHER EDUCATION
Regional Office VIII

LIST OF HIGHER EDUCATION INSTITUTIONS IN REGION VIII
(Provinces of Samar, Eastern Samar and Northern Samar)

	SUC HEIs		Private HEIs
Samar			
1	**Samar State University (SSU) - MC**	1	Calbiga Western Samar College
2	SSU-Mercedes Campus	2	Christ the King College of Calbayog
3	SSU-Paranas Campus	3	Saint Mary's College of Catbalogan
4	SSU-Basey Campus	4	Samar College
5	**NorthWest Samar State University - MC**	5	St.Vincent de Paul College Seminary
6	NwSSU - San Jorge Campus		
Eastern Samar			
1	**Eastern Samar State University - MC**	1	Mater Divinae Gratiae College
2	ESSU- Can-avid Campus	2	Saint Mary's College of Borongan
3	ESSU-Guiuan Campus	3	Our Lady Mercy College
4	ESSU-Salcedo Campus		
5	ESSU-Maydolong Campus		
Northern Samar			
1	**University of Eastern Philippines - MC**	1	Asia College of Advanced Studies in Arts, S + T
2	UEP-Catubig Campus	2	Colegio de San Juan Samar
3	UEP-Laoang	3	Colegio de San Lorenzo Ruiz de Manila
		4	East Pacific Computer College
LOCAL COLLEGE		5	Eastern Visayas Central Colleges
1	Collegio de las Navas	6	Global School for Technological Studies
		7	Northern Samar Colleges
		8	Tan Ting Bing Memorial College Foundation
		9	Saint Francis College

Source: CHEDRO VIII HEMIS Data 2010

Prepared by:

Engr. Nelly L. Labrada
ES II / HEMIS Designate

Reviewed by:

Engr. Socorro Q. Ramos
Chief Education Program Specialist

APPENDIX O

January 8, 2016

MR. JUDE ALLAN A. URMENETA
MIS Head
Eastern Visayas State University
Tacloban City

Sir:

Greetings!

I, Rodolfo F. Dollado, Jr., a student of Samar State University, Catbalogan City is currently working on a dissertation entitled "HEIs Information Systems Acquisition Decision Model Development". It aims to determine the management strategies and practices of outsourcing and in-house development of Information Systems by the HEIs in the Province of Samar.

In view of this, the researcher would like to ask permission from your good office to validate his questionnaire. The validation will be administered to the Head and Staff of MIS or IT Services and other users who are involved in the acquisition, development, and implementation of the information system that your Institution is currently using.

Your positive response will be of great help for the success of this research study.

Thank you and more power!

Respectfully yours,

(Sgd.) RODOLFO F. DOLLADO, JR.
Researcher

Approved:

(Sgd.) JUDE ALLAN A. URMENETA
MIS Head

APPENDIX P

December 19, 2015

MRS. RIZA LYNN O. SIEGA
MIS Head
St. Joseph College
Maasin City

Madam:

Greetings!

I, Rodolfo F. Dollado, Jr., a student of Samar State University, Catbalogan City is currently working on a dissertation entitled "HEIs Information Systems Acquisition Decision Model Development". It aims to determine the management strategies and practices of outsourcing and in-house development of Information Systems by the HEIs in the Province of Samar.

In view of this, the researcher would like to ask permission from your good office to validate his questionnaire. The validation will be administered to the Head and Staff of MIS or IT Services and other users who are involved in the acquisition, development, and implementation of the information system that your Institution is currently using.

Your positive response will be of great help for the success of this research study.

Thank you and more power!

Respectfully yours,

(Sgd.) RODOLFO F. DOLLADO, JR.
Researcher

Approved:

(Sgd)RIZA LYNN O. SIEGA
MIS Head

APPENDIX Q

January 18, 2016

DR. EDMUNDO A. CAMPOTO
University President
Eastern Samar State University
Borongan City, Eastern Samar

Sir:

Greetings!

I am undertaking a research work with the title: HEIs INFORMATION SYSTEM ACQUISITION DECISION MODEL DEVELOPMENT. This is in partial fulfillment of the requirements for the degree in the doctoral course at the College of Graduate Studies of the Samar State University.

In view of this, may I humbly request permission from your good office to allow me to field my research instrument/questionnaire. The questionnaire will be administered to the Head and Staff of MIS or IT Services, IT faculty members, users of the system such as the Cashier & Registrar, and others who have direct participation in the acquisition, development, and implementation of the information system currently used in your institution.

Your favorable approval on this request will certainly help in meeting the objectives of the study.

Thank you very much and more power!

Very truly yours,

(Sgd.) RODOLFO F. DOLLADO, JR.
Researcher

Approved:

(Sgd.) EDMUNDO A. CAMPOTO, Ph.D.
University President

APPENDIX R

January 4, 2016

DR. ROLANDO A. DELORINO
University President
University of Eastern Philippines
University Town, Catarman, Northern Samar

Sir:

Greetings!

I am undertaking a research work with the title: HEIs INFORMATION SYSTEM ACQUISITION DECISION MODEL DEVELOPMENT. This is in partial fulfillment of the requirements for the degree in the doctoral course at the College of Graduate Studies of the Samar State University.

In view of this, may I humbly request permission from your good office to allow me to field my research instrument/questionnaire. The questionnaire will be administered to the Head and Staff of MIS or IT Services, IT faculty members, users of the system such as the Cashier & Registrar, and others who have direct participation in the acquisition, development, and implementation of the information system currently used in your institution.

Your favorable approval on this request will certainly help in meeting the objectives of the study.

Thank you very much and more power!

Very truly yours,

(Sgd.) RODOLFO F. DOLLADO, JR.
Researcher

Approved:

(Sgd.) ROLANDO A. DELORINO, Ph.D.
University President

APPENDIX S

February 1, 2016

BRO. ARIEL C. MANGA, OFM
College President
Christ the King College
Calbayog City, Samar

Dear Bro. Ariel:

Greetings!

I am undertaking a research work with the title: HEIs INFORMATION SYSTEM ACQUISITION DECISION MODEL DEVELOPMENT. This is in partial fulfillment of the requirements for the degree in the doctoral course at the College of Graduate Studies of the Samar State University.

In view of this, may I humbly request permission from your good office to allow me to field my research instrument/questionnaire. The questionnaire will be administered to the Head and Staff of MIS or IT Services, IT faculty members, users of the system such as the Cashier & Registrar, and others who have direct participation in the acquisition, development, and implementation of the information system currently used in your institution.

Your favorable approval on this request will certainly help in meeting the objectives of the study.

Thank you very much and more power!

Very truly yours,

(Sgd.) RODOLFO F. DOLLADO, JR.
Researcher

Approved:

(Sgd.) BRO. ARIEL C. MANGA, OFM
College President

APPENDIX T

February 26, 2016

MS. LEAH MOORE MANGADA
President
Northern Samar Colleges
Catarman, Northern Samar

Madam:

Greetings!

I am undertaking a research work with the title: HEIs INFORMATION SYSTEM ACQUISITION DECISION MODEL DEVELOPMENT. This is in partial fulfillment of the requirements for the degree in the doctoral course at the College of Graduate Studies of the Samar State University.

In view of this, may I humbly request permission from your good office to allow me to field my research instrument/questionnaire. The questionnaire will be administered to the Head and Staff of MIS or IT Services, IT faculty members, users of the system such as the Cashier & Registrar, and others who have direct participation in the acquisition, development, and implementation of the information system currently used in your institution.

Your favorable approval on this request will certainly help in meeting the objectives of the study.

Thank you very much and more power!

Very truly yours,

(Sgd.) RODOLFO F. DOLLADO, JR.
Researcher

Approved:

(Sgd.) LEAH MOORE MANGADA
President

APPENDIX U

January 19, 2016

DR. NANCY L. GETALADO
Dean
College of Information Technology
NwSSU
Calbayog City

Madam:

I am now working on the physical evaluation/observation of the in-house developed and outsourced information systems of HEIs in Samar. Said physical evaluation/observation is one of the objectives in my study that needs to be answered. Its purpose is to determine the performance of the two groups of system in terms of functionality, reliability, usability, efficiency, and sustainability. Moreover, the researcher will be using a guide sheet in observing the performance of the systems.

In view of this, the researcher would like to ask permission from your good office to conduct an expert validation for the above-mentioned guide sheet. The validation will be administered to the IT Faculty of your college. The IT Faculty are chosen due to their knowledge and skill in systems development and so they are highly qualified to examine the items in the guide sheet and make some comments to improve the instrument.

Your positive response will be of great help for the completion of this study.

Thank you and more power!

Respectfully yours,

(Sgd.) RODOLFO F. DOLLADO, JR.
Researcher

Approved:

(Sgd.) NANCY L. GETALADO, Ph.D.
Dean, CIT

APPENDIX V

Questionnaire for In-House Development of Information System

Respondent's Name (Optional):	HEI's Name:	
Respondent's Designation/Position:	HEI's Location:	Date:

PART 1 – PROFILE OF HEI

DIRECTION: Below are items that will describe your Institution in the context of in-house development the Information System. Please put a CHECK [✓] in the box to the answer/s of your choice or write in the space provided as the case may be.

1. **What is the current utilization of the Information System in your Institution?** (Please check as many as applicable)

- ☐ Students enrollment and records management
- ☐ Finance and accounting management
- ☐ Library services
- ☐ Personnel records management
- ☐ Payroll processing
- ☐ Teaching and learning
- ☐ Research services
- ☐ Medical & dental services
- ☐ Extension services
- ☐ Procurement management and inventory

Others. Please specify. ______________________________

2. **How long has the system been implemented?** ______________________
3. **What is the total budget allocation of the outsourced information system?** ____________
4. **Management structure:**

Is there an Office that manage the information system? ___ YES ___ NO

If YES, answer the following questions; if NO, proceed to item No. 5.

41 How many personnel are assigned? _____

42 Are the Head and personnel qualified? ___ YES ___ NO

43 Is there an Organizational Structure? ___ YES ___ NO

5. **What activities provide support to the Operation of the in-house developed information system?** (Please check as many as applicable)

- ☐ On-going technical support, e.g. maintenance and enhancement
- ☐ Regular meeting with system development team
- ☐ Monitoring and evaluation of cost
- ☐ Assessment of problems and risks
- ☐ Assessment of the performance of the developed system
- ☐ Frequent review of the information system development plan

- [ ] Training and re-training on the use of the system
- [ ] Documentation of changes in system development processes
- [ ] Preparation and dissemination of status report
- [ ] Debugging of the developed system
- [ ] Test-run of the developed system

Others. Please specify. ______________________________

PART 2 – MANAGEMENT STRATEGIES

What management strategies your Institution has employed in in-house development of the information system presently used?

Please CHECK as many as applicable strategies and indicate the degree of implementation of the selected strategies using the following scale:

5 - Fully Implemented (FI)
4 - Highly Implemented (HI)
3 - Moderately Implemented (MI)
2 - Slightly Implemented (SI)
1 - Not Implemented (NI)

A. **Planning**		FI 5	HI 4	MI 3	SI 2	NI 1
1.	Assess current systems					
2.	Conduct user need analysis					
3.	Identify the system to be developed					
4.	Define schedule, alternatives, and scope of the system					
5.	Formulate system development team					
6.	Acquire needed I.T. infrastructures					
7.	Consider selection process for vendors and suppliers of the needed I.T. infrastructures					
8.	Allocate funds for the acquisition of resources					
9.	Consider monitoring and evaluation of system development activities					
10.	Design Information System Development Plan					
11.	Others. Please specify. ______________________					

B. **Organizing**		FI 5	HI 4	MI 3	SI 2	NI 1
1.	Set goal and milestones of the system					
2.	Assemble members of system development team					
3.	Prepare technical resources such as hardware & software					
4.	Gather information on vendors and suppliers of the needed I.T. infrastructures					

5.	Determine tasks and activities in the development of the information system					
6.	Establish channel of communication and coordination					
7.	Others. Please specify. ______________________________					
C. Directing		FI 5	HI 4	MI 3	SI 2	NI 1
1.	Assign tasks to qualified and skilled staff					
2.	Provide compensation to the members of the development team in a form of deloading, honorarium, service credit, etc.					
3.	Execute system development activities according to the plan					
4.	Supervise tasks and activities					
5.	Disseminate related information to concerned staff or office					
6.	Procure technical resources, such as hardware and software, needed in the development of the system					
7.	Others. Please specify. ______________________________					
D. Controlling		FI 5	HI 4	MI 3	SI 2	NI 1
1.	Compare system development processes and activities against the plan					
2.	Compare costs against the approved budget allocation					
3.	Perform system development processes and activities in a timely manner					
4.	Develop system based on standards					
5.	Develop system based on system requirements set					
6.	Review and approve changes in systems development processes and requirements					
7.	Allow only authorized personnel to have access to records and documents used in the development of the information system					
8.	Keep track utilization of the physical resources like hardware and software					
9.	Others. Please specify. ______________________________					
E. Monitoring and Evaluation		FI 5	HI 4	MI 3	SI 2	NI 1
1.	Validate completed tasks and systems components					
2.	Evaluate costs to ensure that they are in accordance with the allocated budget					

3.	Keep track schedule of activities to determine the progress of system development and achieve systems implementation on the deadline					
4.	Monitor performance of the personnel involved in system development					
5.	*Record completed tasks by development team members*					
6.	Develop status report to determine the progress of system development					
7.	Review and validate reports to ensure correctness and accuracy					
8.	Evaluate delivered I.T. infrastructures before acceptance					
9.	Disseminate results of monitoring and evaluation					
10.	Others. Please specify. ______________________________					

PART 3 – PRACTICES

What practices your Institution has observed for the in-house development of information system?

Please CHECK as many as applicable practices and indicate the degree of practice of the selected strategies using the following scale:

5 - Always Practiced (AP)
4 - Often Practiced (OP)
3 - Sometimes Practiced (SP)
4 - Rarely Practiced (RP)
1 - Not Practiced (NP)

A. **Requirements Determination**		AP	OP	RP	SP	NP
		5	4	3	2	1
1.	Involve users to participate in the design, scope, and functionality of the system to be developed					
2.	Use sample forms and reports as bases in defining system requirements					
3.	Use tools and methods such as interview, observation, questionnaire, and on-site visit in determining system requirements					
4.	Use standard models and diagrams in systems development to better understand the requirements					
5.	Ensure that the developed system is based from the established technical and non-technical requirements					
6.	Others. Please specify. ______________________________					

B. Implementation		AP 5	OP 4	RP 3	SP 2	NP 1
1.	Develop deployment plan for the new system					
2.	Prepare the required resources in the implementation such as hardware and software					
3.	Install the developed system in the actual site					
4.	Test the installed system with actual data					
5.	Adopt conversion strategies such as parallel, direct, pilot, and phased conversion					
6.	Prepare complete documentation of the developed system					
7.	Conduct training on the use of the new system					
8.	Provide post-deployment support such as maintenance and enhancement					
9.	Others. Please specify. ______________________					
C. Documentation		AP 5	OP 4	RP 3	SP 2	NP 1
1.	Record every completed task of systems development					
2.	Record the changes in the system requirements					
3.	Develop user documentation which tells users how to use the system					
4.	Develop system documentation which includes all of the documents describing the developed system					
5.	Review the documentation to ensure that it conforms with the plan					
6.	Others. Please specify. ______________________					
D. Assessment		AP 5	OP 4	RP 3	SP 2	NP 1
1.	Conduct assessment of the processes observed in system development					
2.	Perform assessment activity according to the guidelines and criteria					
3.	Assess important concerns of systems development such as cost, time, security, and risk					
4.	Prepare a report of the assessment					
5.	Disseminate the results of the assessment to concerned individuals					
6.	Conduct immediate action on assessment results					
7.	Others. Please specify. ______________________					

E. Cost Management		AP 5	OP 4	RP 3	SP 2	NP 1
1.	Develop approximation or estimate of the costs of the resources needed to develop the system					
2.	Allocate the overall cost estimate to individual work items to establish baseline for measuring performance					
3.	Record every expenditure that occurs					
4	Conduct accounting and auditing of expenditures					
5.	Disseminate the results of accounting and auditing of expenditures					
6.	Compare the actual cost with the allocated budget for system development					
7.	Keeps track of the changes in the development of the system to avoid additional cost					
8.	Gather baseline information about prices of I.T. infrastructures needed in system development					
9.	Others. Please specify. ______________________					
F. Risk Management		AP 5	OP 4	RP 3	SP 2	NP 1
1.	Identify potential risks that may cause delay to systems development					
2.	Perform risk analysis and assessment					
3.	Perform monitoring of systems development activities to avoid potential risks					
4	Ensure that only authorized personnel perform systems development activities					
5.	Evaluate the delivered I.T. infrastructures by vendors and suppliers					
6.	Provide sufficient security mechanisms on the use of the system					
7.	Review frequently the processes in systems development to anticipate potential risk					
8.	Others. Please specify. ______________________					

Thank you for your time in answering the questionnaire.

APPENDIX W

Questionnaire for Outsourcing of Information System

Respondent's Name (Optional):	HEI's Name:	
Respondent's Designation/Position:	HEI's Location:	Date:

PART 1 – PROFILE OF HEI

DIRECTION: Below are items that will describe your Institution in the context of outsourcing the Information System. Please put a CHECK [✓] in the box to the answer/s of your choice or write in the space provided as the case may be.

1. **What is the current utilization of the Information System in your Institution?** (Please check as many as applicable)

   - ☐ Students enrollment and records management
   - ☐ Finance and accounting management
   - ☐ Library services
   - ☐ Personnel records management
   - ☐ Payroll processing
   - ☐ Teaching and learning
   - ☐ Research services
   - ☐ Medical & dental services
   - ☐ Extension services
   - ☐ Procurement management and inventory

   Others. Please specify. ______________________________

2. **How long has the system been implemented?** ______________________
3. **What is the total budget allocation of the outsourced information system?** ____________
4. **Management structure:**

   Is there an Office that manage the information system? ___ YES ___ NO
   If YES, answer the following questions; if NO, proceed to item No. 5.

   4.1 **How many personnel are assigned?** _____
   4.2 **Are the Head and personnel qualified?** ___ YES ___ NO
   4.3 **Is there an Organizational Structure?** ___ YES ___ NO

5. **What activities provide support to the Operation of the outsourced information system?** (Please check as many as applicable)

   - ☐ On-going technical support, e.g. warranty and enhancement
   - ☐ Communication between service provider and HEI
   - ☐ Regular meeting with the service provider
   - ☐ Consultation with the service provider
   - ☐ Monitoring and evaluation of outsourcing processes
   - ☐ Assessment of the performance of the outsourced system

- [ ] Reviewing the terms and conditions set in the contract
- [ ] Training and orientation on the use of the system
- [ ] Documentation of systems development processes
- [ ] Preparation and dissemination of status report
- [ ] Debugging of the outsourced system
- [ ] Test-run of the outsourced system

Others. Please specify. ____________________

PART 2 – MANAGEMENT STRATEGIES

What management strategies your Institution has employed in outsourcing of the information system presently used?

Please CHECK as many as applicable strategies and indicate the degree of implementation of the selected strategies using the following scale:

5 - Fully Implemented (FI)
4 - Highly Implemented (HI)
3 - Moderately Implemented (MI)
2 - Slightly Implemented (SI)
1 - Not Implemented (NI)

		FI	HI	MI	SI	NI
A. Planning		5	4	3	2	1
1.	Assess current systems					
2.	Conduct user need analysis					
3.	Define the scope of the information system					
4.	Conduct cost-benefit analysis					
5.	Formulate Technical Working Group (TWG)					
6.	Conduct background investigation of the service provider					
7.	Develop criteria in the selection of service providers					
8.	Allocate funds for outsourcing					
9.	Establish contract					
10.	Define performance metrics for the service provider					
11.	Monitor processes within the term					
12.	Establish contract termination					
13.	Others. Please specify. ____________________					
		FI	HI	MI	SI	NI
B. Organizing		5	4	3	2	1
1.	Gather benchmark information about the service provider					
2.	Conduct meetings with service provider					
3.	Finalize the contract					
4	Assemble members of Outsourcing Team or TWG					

5.	Define communication and coordination schemes					
6.	Prepare technical resources, such as hardware & software					
7.	Others. Please specify. ______________________					
C. Directing		FI 5	HI 4	MI 3	SI 2	NI 1
1.	Assign tasks to staff with knowledge and skills in outsourcing activities					
2.	Supervise activities performed by the service provider					
3.	Communicate relevant information to concerned staff					
4.	Others. Please specify. ______________________					
D. Controlling		FI 5	HI 4	MI 3	SI 2	NI 1
1.	Compare processes and activities against the terms in the contract					
2.	Compare costs against the approved budget allocation					
3.	Ensure that processes and activities are performed in a timely manner					
4.	Ascertain that system development activities are performed based on system requirements set					
5.	Review changes in the processes and design made by the service providers					
6.	Approve changes in the processes and design made by the service providers					
7.	Allows authorized personnel to have access to records and outsourcing documents					
8.	Others. Please specify. ______________________					
E. Monitoring and Evaluation		FI 5	HI 4	MI 3	SI 2	NI 1
1.	Validate completed tasks and systems components					
2.	Review contract for consistency in the terms					
3.	Conduct on-site visits by the Project Monitoring Committee (PMC)					
4.	Evaluate costs					
5.	Track schedule of activities					
6.	Record completion of tasks by service providers					
7.	Disseminate results of monitoring and evaluation					
8.	Others. Please specify. ______________________					

PART 3 – PRACTICES

What practices your Institution has observed for the in-house development of information system?

Please CHECK as many as applicable practices and indicate the degree of practice of the selected strategies using the following scale:

5 - Always Practiced (AP)
4 - Often Practiced (OP)
3 - Sometimes Practiced (SP)
4 - Rarely Practiced (RP)
1 - Not Practiced (NP)

		AP	OP	RP	SP	NP
A. Requirements Determination		5	4	3	2	1
1.	Allow users to participate in determining system requirements					
2.	Provide service providers with sample forms and reports used by HEIs as bases in defining system requirements					
3.	Allow service providers to use tools such as interview, observation, questionnaire, and on-site visit in determining system requirements					
4	Record every changes made by the service provider in the system requirements					
5.	Others. Please specify. ______________________					
		AP	OP	RP	SP	NP
B. Implementation		5	4	3	2	1
1.	Require service provider to install the developed system in the actual site					
2.	Require service provider to test the installed system with actual data					
3.	Require service provider to conduct training on the use of the new system					
4	Require service provider for user documentation and system documentation					
5.	Require service provider for post-development support such as system maintenance and consultation as indicated in the contract					
6.	Others. Please specify. ______________________					

C. Documentation		AP 5	OP 4	RP 3	SP 2	NP 1
1.	Record all outsourcing-related processes for audit purposes					
2.	Record every completed task of systems development					
3.	Record the changes made by the service provider in the design of the system					
4	Record contract problems and issues					
5.	Require system documentation which includes all of the documents describing the developed system					
6.	Require user documentation which tells users how to use the system					
7.	Review the technical document to ensure that it conforms with the contract					
8.	Others. Please specify. ____________					

D. Assessment		AP 5	OP 4	RP 3	SP 2	NP 1
1.	Assess the service provider's capability in terms of financial, technical, and human resources					
2.	Conduct assessment on service provider's performance in terms of services delivery					
3.	Use guidelines in assessing the performance of the service provider					
4	Conduct assessment activity in accordance with the terms and conditions indicated in the contract					
5.	Conduct assessment by Project Monitoring Committee (PMC)					
6.	Consider important areas of assessment such as cost, time, security, risk					
7.	Disseminate results of assessment to both parties – the HEI and the service provider					
8.	Others. Please specify. ____________					

E. Cost Management		AP 5	OP 4	RP 3	SP 2	NP 1
1.	Conduct financial planning to determine realistic cost of outsourcing					
2.	Determine scope and pricing of the system to be developed by the service provider					
3.	Conduct cost accounting and auditing of expenditures					
4	Compare actual cost with the contracted cost of the system					

5.	Keep track of the additions and revisions in the design of the system to avoid additional cost					
6.	Perform adjustments in pricing of the services as agreed by both parties					
7.	Review the terms and conditions of the contract to evaluate cost					
8.	Others. Please specify. ______________________					
		AP	OP	RP	SP	NP
F.	**Risk Management**	5	4	3	2	1
1.	Evaluate service provider's capabilities to invest in and support the required technology by HEI in terms technical, human, and financial resources					
2.	Evaluate service provider's use of third parties or partners that would be used to support the outsourced operations					
3.	Consider whether additional system components and features requested by the service provider are necessary					
4	Perform on-site visits, where necessary, to ensure that service provider operates and performs services according to the terms and conditions					
5.	Determine if the service provider provides sufficient security precautions on the use of the system					
6.	Review accomplishment reports prepared by the service provider to determine whether the reports are adequate and accurate					
7.	Determine whether the HEI will have complete access to the system maintained by the service provider					
8.	Review the terms and conditions of the contract occasionally to avoid potential risks					
9.	Others. Please specify. ______________________					

Thank you for your time in answering the questionnaire.

APPENDIX X

Information System Performance Observation Sheet

HEI's Name:	
HEI's Location:	Date:
System:	

FUNCTIONALITY	YES	NO	REMARKS
A. Access			
1. Login with username and password			
2. Display error message for invalid access			
3. Allow remote access			
4. Allow log-in through a device like biometric			
5. Provide password recovery			
6. Provide username and password modification			
7. Efficient login activity			
B. Data entry & create records			
1. Show logical sequence of data entry			
2. Provide input verification and control			
3. Provide auto-format date entry			
4. Use efficient input methods such as radio buttons, checkboxes, & dropdown			
5. Provide default values			
6. Display error and feedback messages for wrong entry			
7. Display confirmation message to save records			
8. Accept data from devices like barcode, biometric, etc.			
9. Import files from other sources, e.g. Excel file			
C. Search & retrieve records			
1. Search with subject categories, e.g. number, lastname, firstname, etc.			
2. Search based on a combination of subject categories within a single query			
3. Searched records are displayed in order, e.g. ascending			
4. Search records using devices			
5. Efficient search & retrieval of records			
D. Records processing			
1. Perform query/search, update, delete, and report generation			
2. Generate accurate output			
3. Output can be exported to other file types, e.g. PDF			
4. Maintain logs for processed records			
5. Efficient records processing			
E. Edit & Update records			
1. Only authorized user can edit/update			
2. Display confirmation message to edit/update			
3. Database is updated when record is edited/updated			

4 Maintain logs for edited/updated records			
F. Delete records			
1. Display confirmation message to delete record			
2. Remove record based on user request			
3. Database is updated when record is deleted			
4 Only authorized use can delete record			
5. Maintain logs for deleted records			
G. Report generation			
1. Print reports based on user need			
2. Print reports based on specific query			
3. Provide print logs/activity logs			
4 Print reports in a specified format			
5. Efficient generation of reports			
6. Only authorized user can generate report			
H. Interoperability			
1. Can access remote data			
2. Efficient sharing of data			
3. Reliable network connectivity			
I. Error prevention & control			
1. Display warning messages and reminders			
2. Display error messages for erroneous entries			
3. Retry task after an error			
4 Provide Undo function to reverse actions			
5. Provide confirmation message before saving			
J. Security			
1. Assign user accounts & password 2. Provide privileges to access & view records			
RELIABILITY	YES	NO	REMARKS
A. Minimal Error			
1. *Free from a frequent system error or system crash*			
2. Free from logic errors, e.g. incorrect computation			
B. Fault tolerance			
1. Continue operating properly in the event of the failure			
2. Restore normal operation after a failure			
C. Backup and recovery			
1. Maintain backup copies of records			
2. Restore records following a system malfunction			
3. Archive historical data			
D. Scalable			
1. *Accommodate concurrent access to the same database by multiple users*			
2. Process user requests simultaneously			
3. Continue to function with increasing workload			
USABILITY	YES	NO	REMARKS
A. Navigation			
1. Properly structured menus and buttons			
2. Easy to find information			
3. Use meaningful labels of commands and buttons			
B. Interface			
1. *Appealing screen layout and color*			

2. Show intuitive design			
3. Use simple and natural dialogue			
4. Use state of the art design			
C. Ease of use			
1. Require fewest steps possible to accomplish task			
2. Recover from mistakes quickly and easily			
3. Clear and understandable instructions			
4. Enable to accomplish tasks more quickly			
5. Locate information quickly			
6. Easy navigation			
D. Help mechanism			
1. Display of Help messages on the screen			
2. Available tutorials			
3. Provide online help			
EFFICIENCY	YES	NO	REMARKS
A. Turnaround time			
1. Minimal amount of time to complete a process			
B. Throughput			
1. More transactions are handled in a given amount of time			
SUSTAINABILITY	YES	NO	REMARKS
A. Maintainability and enhancement			
1. Source code can be easily modified			
2. Enable different access privileges to be assigned to individual users or groups			
B. Adaptability			
1. Can be easily installed in a different platform			
2. Can function in a different environment			
C. Documentation			
1. User manual is readily available			
2. Technical documentation is readily available			
3. Provide online help and tutorial			

HEI Representative:

____

(Designation/Position & signature over printed name)

CURRICULUM VITAE

CURRICULUM VITAE

NAME	:	RODOLFO F. DOLLADO, JR.
ADDRESS	:	Purok 3, Brgy. Carmen, Calbayog City, Samar
DATE OF BIRTH	:	September 26, 1974
PLACE OF BIRTH	:	Tacloban City
SEX	:	Male
CITIZENSHIP	:	Filipino
CIVIL STATUS	:	Married

EDUCATIONAL ATTAINMENT

Post-Graduate Studies	:	Samar State University Catbalogan City Doctor of Philosophy Major in Technology Management 2010 – 2017
Graduate Studies	:	HanNam University Daejeon, Korea Master of Science in Information Technology 2003 – 2005
		Tiburcio Tancinco Memorial Institute of Science and Technology Calbayog City Master in Business Administration 1997 – 2002
College	:	University of Cebu Cebu City Bachelor of Science in Information & Computer Science 1991 – 1996

Secondary	:	Christ the King College Calbayog City 1987 – 1991
Elementary	:	Calbayog Pilot Central School Calbayog City 1981 – 1987

WORK EXPERIENCE

Teaching	:	Faculty Member Northwest Samar State University Calbayog City June 1999 – Present
		College Teacher Christ the King College Calbayog City November 1996–May 1999
Administrative	:	Director Quality Assurance Northwest Samar State University Calbayog City June 2014 – Present
		In-Charge Printing & Book Store Northwest Samar State University Calbayog City June 2008 – June 2010
		In-Charge Instructional Media Center Tiburcio Tancinco Memorial Institute of Science and Technology Calbayog City June 2006 – June 2008

SEMINARS, TRAININGS, WORKSHOPS, & CONFERENCES ATTENDED

Title of Training/Seminar	Sponsoring Agency	Venue/Year
IBM SPSS Training for Researchers	Office of Research & Extension Services, Northwest Samar State University	Northwest Samar State University, 2016
ISO 9001:2008 Quality Management System Internal Quality Auditor Training Course	Cebu Technological University	Cebu Technological University, 2016
Orientation on "Meeting your Horizontal Type"	Commission on Higher Education	Cebu City, 2016
Seminar-Workshop on Research Process and Writing of Scholarly Articles for Journal Publication	Research & Development Center, Silliman University	Silliman University, Dumaguete City, 2016
AACCUP Annual National Conference	Accrediting Agency of Chartered Colleges & Universities in the Phil.	Manila, 2016
13th National Conference on Information Technology Education	Philippine Society of Information Technology Educators (PSITE)	Angeles Foundation University, Angeles City, 2015
C/C++ with Abstraction	Philippine Society of Information Technology Educators (PSITE) VIII	Northwest Samar State University, 2015
28th ACCUP Annual Conference	Accrediting Agency of Chartered Colleges & Universities in the Phil.	Manila Hotel, 2015
Outcomes-Based Education Orientation Seminar	Northwest Samar State University	Audio-Visual Room, Northwest Samar State University, Calbayog City, 2015
Zonal Public Consultation on the Policies, Standards, & Guidelines (PSG) for BSCS, BSIS, BSIT, & BLIS Programs to Outcomes-Based Education	Commission on Higher Education	Crown Plaza, Cebu City, 2014
Seminar-Workshop on Guidance & Counseling	Northwest Samar State University	Audio-Visual Room, NwSSU, Calbayog City, 2014
SPMS Simulation: Priming for Performance-Based Bonus	State Universities & Colleges Financial Executives, Inc. (SUCFINEX)	Crown Regency Hotel, Boracay, 2014

LIST OF TABLES

LIST OF TABLES

Table | Page

Table		Page

Table Page

Table		Page

Table | Page

LIST OF FIGURES

LIST OF FIGURES

Figure	Page

Figure | Page

Figure | Page

Figure		Page