The Impact of Enterprise Resource Planning (ERP) in Higher Education Institutions: Support in improvement of academic processes

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Abstract

Recently the universities in Pakistan started replacing their old legacy systems with Enterprise Resource Planning (ERP) systems to improve their academic and administrative processes. Previously, ERP systems were used in business organizations to gain a competitive edge over competitors. The Higher Education Commission (HEC) has implemented ERP systems at eight different universities in Pakistan. The HEC has invested a significant amount of money to facilitate the integration, customization and implementation of these systems. Little research is reported to assess the impact of ERP systems in higher education institutions. Previous studies reported in the literature focus mainly on Critical Success Factors (CSFs) and risk factors in success and failure of ERP systems. To explore the research problem, various Information System (IS) success models were studied as part of the literature review. This study also presents a conceptual research model based on re-specification of the DeLone and McLean IS success model to empirically measure the impact of ERP in higher education in the Pakistani universities' context. This research study empirically evaluated the post implementation impact of the ERP systems in higher education institutions, focusing on improvement in the academic and administrative processes. This study used a sequential explanatory mixed method design approach to meet the objectives and address the research questions. Quantitative data were collected from a survey involving 230 respondents (120 students and 110 faculty members) from two selected universities that had implemented ERP systems. The qualitative data was collected through 12 interviews (five faculty members, five heads of department and two VCs). The results of both the quantitative and qualitative findings highlight that the ERP implementation has a positive and significant impact on the improvement of academic processes such as student satisfaction, teaching quality, better communication and feedback mechanism and the higher management decision-making process in Pakistani university contexts. The research findings will help future researchers to build on the research, perhaps with different samples and methodologies and will be useful for higher education to formulate strategies for the implementation of ERP system in their respective public-sector universities.

Keywords: Enterprise Resource Planning (ERP) Systems, Higher Education, mixed methods research, DeLone and McLean IS Success model

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List of Abbreviations

Abbreviation	Description
AVE	Average Variance Extracted
BI	Business Intelligence
CEO	Chief Executive Officer
CSFs	Critical Success Factors
CMS	Campus Management Solution
CMV	Common Method Variance
D&M	DeLone and McLean
FCM	Financial Management
HCM	Human Capital Management
HE	Higher Education
HEC	Higher Education Commission
HEIs	Higher Education Institutions
HoD	Heads of Department
LMS	Learning Management System
IS	Information System
IT	Information Technology
IQ	Information Quality
MRP	Material Requirements Planning
ROI	Return on Investment
PLS	Partial Least Square
PIS	Participant Information Sheet
PERN	Pakistan Educational Research Network
QEC	Quality Enhancement Cell
QS	Quacquarelli Symonds
SCM	Supply Chain Management
SEM	Structure Equation Modeling
SOP	Standard Operating Procedure

SPSS	Statistical Package for the Social Sciences
SQ	System Quality
SERVQ	Service Quality
SSE	Sum of Squared prediction Errors
SSO	Squared Sum of Observation
TAM	Technology Acceptance Model
TOE	Technology-Organization-Environment
TTF	Task Technology Fit
US	User Satisfaction
VC	Vice Chancellor
VPREC	Virtual Programme Research Ethics Committee

Chapter 1- Introduction

1.1 Research Motivation and Problem

The state of higher education in Pakistan is changing. The external sources of funding of higher education institutions are being squeezed due to the financial crunch in 2008. In higher education institutions, the financial pressures are significantly growing to decrease the operational expenditures and streamline the business processes. Government funding for universities is decreasing and the expectations of stakeholders are increasing. The universities are under pressure to deliver high quality educational services at affordable cost (Seo, 2013). During the last decade, higher education institutions have been forced to cut the operational costs and systemize and integrate business processes. The ERP system is considered as a very powerful solution for higher education institutions to replace legacy standalone computer systems (Pollock & Cornford, 2004).

The term ERP (Enterprise Resource Planning) was first coined in 1990s as the standard platform for business organizations. Many manufacturing organizations use ERP systems to create a seamless integration across several functional units to enhance their business performance. The last decade has seen a remarkable global extension of ERP systems in the higher education sector (Noaman & Ahmed, 2015).

In response to that demand, higher education institutions in Pakistan have started implemented Enterprise Resource Planning (ERP) systems to gain a competitive edge over the competitors and enhance the efficiency in the processes. ERP systems have automated and integrated the key processes related to academic and administrative services (Shatat, 2019). The Higher Education Commission (HEC) has invested a significant amount of funding to facilitate the customization and implementation of ERPs in eight selected universities as a pilot run.

Although there is much research reporting on the implementation of ERP systems in business, less research has been produced on the impact of ERP systems in higher education. In Pakistan, small-scale research has been carried out on implementation issues and efficiency of the ERP systems, which suggests that there might be a lack of research in the evaluation of ERP systems in the university environment. The reported

research in the contextual areas mainly identified the Critical Success Factors (CSFs) for the effective implementation of ERP systems (Abugabah, 2010; Nizamani et al., 2014). This research study intends to measure the post implementation impact of the ERP system in higher education institutions, focusing on improvement in the academic and administrative processes (Sadiq, 2016). HEC (2016) has implemented the ERP systems at eight different public sector universities as a pilot project to automate a variety of academic administrative processes (Khan, 2017). These universities are public funded and geographically distributed in the country. But, I selected two universities for the research to keep the research data manageable. The selection of sample universities for data collection would be based on easy accessibility and reach to potential participants. HEC (2016) obtained an off-the-shelf solution to be customized and implemented at all selected universities with single technology partner (Khan, 2017).

1.2 Overview of Higher Education in Pakistan

In Pakistan education beyond twelve years of schooling is known as higher education (tertiary education). The Higher Education Commission (HEC) is the primary regulator of higher education in Pakistan (Usman, 2014). HEC is responsible for the development of higher education policies, quality assurance, curriculum development, degree recognition and the establishment of new institutions and strengthening and improvement of existing universities. In recent years the Government of Pakistan has invested considerable amounts of money in higher education through HEC. The amount has been spent in faculty development and infrastructure development of the HEIs. As a result the number of publications in high impact factor journals has increased and Pakistani universities are gradually developing their visibility in a QS (Quacquarelli Symonds) world university ranking.

In the 21st century, higher education in Pakistan is facing multi-dimensional challenges in governance, including technology advancement, financial problems, external relations and the relevance of research. Higher education in Pakistan has shifted from an elite system to mass education with increased enrolment in on campus and off campus programs (HEC, 2016). To cope with these challenges, universities see the need for change of facilities, their mission and vision, and processes and programs to address

these challenges of the 21st century. Usman (2014) mentioned that before the implementation of ERP, universities were using standalone legacy systems for the management of their administrative, financial and academic processes. This meant that information stores related to students, courses, finance and alumni were operating in silos and there was no central repository, which substantially affected the smooth running of day-to-day academic and administrative affairs of the university. There was no central information flow between departments of the university. The decisions made by higher management were based on assumptions and the discretion of the authority. The data related to student attendance and grades was kept manually by the faculty members and then the data was transferred to the concerned sections on manual sheets. Quality Enhancement Cell (QEC), which is responsible for ensuring the quality of the programs, was collecting student feedback on manual forms and the combined feedback was not transferred to faculty members (Akhtar & Kalsoom, 2012). Clearly, automation of these processes would be beneficial to institutions.

The academic processes in higher education take account of the admissions process of students, course registrations in each semester, timetables, classroom attendance, teaching and lesson planning, quizzes, results and other activities related to classroom teaching. QEC conducts the feedback from students at the start and end of each semester regarding classroom teaching, level of preparation of the teacher, the course content and student assessment.

The administrative process in higher education includes recruitment, student finances, HR, accounting, payroll, billing and purchase and inventory. Management decisions in higher education are related to students, faculty and staff. Higher education management makes decisions regarding the progress of student learning, academic quality and decisions regarding tuition waivers and other fees. Higher education management makes decisions regarding faculty members' performance, confirmation in jobs and also makes promotion decisions based on self-evaluation sheets and student feedback. Before the implementation of ERP all the above decision were carried out manually without any management reports (Vincent, 2017; Seo, 2013). Clearly, this was challenging for HEI management.

The Higher Education Commission (HEC) intervention, reduction in government funding and increased enrollment in higher education have demanded change in governance and management practices of higher education institutions (Allen, Kern, & Havenhand, 2002). To respond to these issues and to increase efficiency and transparency in the processes, the HEC has implemented ERP systems at eight universities in Pakistan as a pilot project. HEC has invested a significant amount to facilitate the customization and implementation of ERPs in eight universities. It was suggested that in addition to solving the above challenges, the implementation of ERP systems would also assist the administration in providing services to students, faculty and staff through self-service modules, transformed business processes, improved academic processes, and increased efficiency (Vincent, 2017).

1.3 ERP Systems in Higher Education

Hossain (2001) defined ERP systems as Software systems that facilitate seamless integration of different modules, providing flow of information between all functions of the enterprise. This is similar to how Seo (2013) defined ERP as a software solution that integrates different business functions into a single system within an enterprise. Several definitions are given in the published literature such as:

" *ERP (enterprise resource planning systems) comprises a commercial software package that promises seamless integration of all the information flowing through the company-financial, accounting, human resources, supply chain and customer information*" (Hossain, 2001, p. 16).

"*Enterprise Resource Planning (ERP) is a complex system which is very useful in an organization by making resources accessible from one interface, hence improving efficiency, data integrity and customer satisfaction*" (Simon, 2016, p. vi).

"*An ERP is a multi-module application Software package, which tightly integrates data and business processes for sharing information in an organization (Abugabah & Sanzogni, 2010, p. 20)"*.

In the Higher Education setting, ERP is a pre-packaged software solution that integrates and automates all the academic and administrative processes. Typical academic processes include registration, admission, class timetable, attendance, examination, faculty evaluation, results, student records and student self-service (Shoeby & Rehma,

2018). The administrative processes include accounting, payroll, HR, Recruitment, employee self- service and leave management, etc. Clearly, this automated data gathering offers the potential to support decision making in different levels of the organization.

The ERP system has several modules for handling the different functions in higher education institutions, such as CMS (Campus Management Solution), FCM (Financial Management), HCM (Human Capital Management) and SCM (Supply Chain Management) as shown in figure 1.1. A CMS is an integrated solution that manages the entire student lifecycle from initial enrollment, student records, managing courses, student financials, attendance, assessment, course evaluation, final graduation and alumni relationships (Schindel, 2018). CMS supports much functionality of the teaching and learning processes (Alt & Auth, 2010). It also supports many alerts to students through a self-service module (Pollock & Cornford, 2004). However, the ERPs used in higher education institutions are different from ERPs used in enterprises. The universities ERP objectives are non-profit and ERPs are used as learning management system, student management system, registration management system and examination management systems and data can be used to 'cross fertilize' these systems (Abugabah & Sanzogni, 2010).

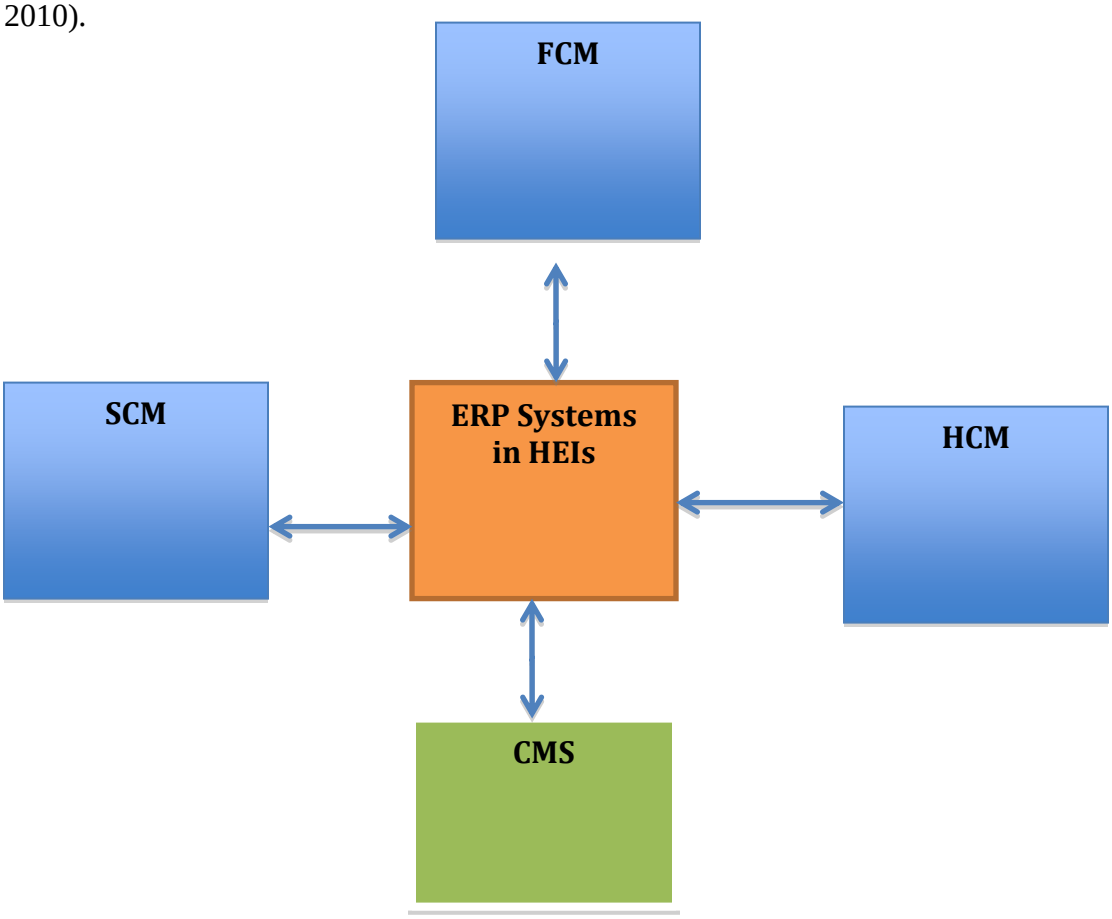


Figure 1: ERP Systems in Higher Education (Different Modules)

Higher educational institutions have implemented the ERP systems to automate and customize their business processes (Billy, Olugbara, & Ray, 2014). ERP systems are implemented in higher education to improve performance and efficiency of the organization to cope with the changing environment. Despite that, ERP promises to benefit the organizations, and even though it is a substantial capital investment, it is not necessarily the case that all ERP implementations have successful outcomes (Singh & Arora, 2018). The ERPs were implemented in eight public funded higher education institutions; selected nationwide to be demographically and regionally representative and my university is one of the beneficiaries selected by the HEC for implementation of the ERP systems (Khan, 2017).

The core processes of HEIs are teaching and learning. The purpose of this study is to research the impact of ERP systems on user performance to see whether the ERP system components work efficiently in complex environments of HEIs (Abugabah, Sanzogni, & Alfarraj, 2015). A review of the literature found hardly any research work that studied the impact of ERPs in higher education institutions with particular emphasis on support in academic processes and higher education leadership decision-making. (Nizamani, Khoumbati, Ismaili, & Nizamani, 2014). This means that there is a noticeable research gap in this area, particularly in my own context (Althonayan & Papazafairopoulou, 2013). This study has researched and evaluated the post implementation impacts of ERP systems at the end-user level, where actual benefits and impacts are created or not. The results of the study can be used by the HEC and HEIs to inform further expansion of the ERP systems to other Universities in Pakistan.

1.4 Research Aim and Objectives

The main objective of this research study was to explore the impact of ERP implementation in higher education institutions in Pakistan to improve the academic and administrative processes (Ahmer, Demir, Tofallis, & Asad, 2016). The ERP implementation in HEIs is different from business organizations because they have

different environments and conditions. The ERP systems are used by the HEIs to support faculty, managers and students in the fulfillment of a variety of academic needs (Nizamani, Khoumbati, Ismaili, & Nizamani, 2014). The research study is useful in the local context of higher education of Pakistan. To create a high level impact of the research study, it is my intention for the results to be shared with higher education leadership for making decisions regarding the implementation of ERP in different HEIs of Pakistan in the future (Chuang & Chen, 2006).

Following are the main objectives of the research study:

1.5 Research Questions

To assess the post implementation effect of ERP systems in the improvement of teaching and learning processes and leadership decision-making in higher education institutions the following two research questions have been used:

1. To what extent is the impact of ERP on the academic processes being predicted by system quality, information quality, and service quality, user satisfaction, and perceived net benefits?
2. To what extent do ERP systems contribute to decision making by higher education leadership?

This study explores the following sub-questions:

1. What, if any, are the benefits of the ERP systems to meet student academic needs?
   a. Do students find the ERP system easy to use?
2. What, if any, are the benefits to support faculty in the HE academic processes after the ERP systems implementation compared to earlier manual systems?
3. What, if any, are the challenges faced in achieving the improvement of academic processes after the ERP systems implementation, from both a faculty and student perspective?
4. What, if any, might be improvements in teaching methodology, based on semester end of course evaluations in the ERP systems from a faculty perspective?
5. What are the improvements in higher education leadership decision-making after the implementation of ERP systems from a management perspective?

a. How has ERP changed their decision-making?

b. How, if at all, has the availability of the ERP data set helped them in making their decisions?

The more general questions (sub-questions one and two of the research study related to the improvement of academic processes) of the research study have been explored in the quantitative part. The qualitative part explored the third and fourth sub question related to the improvement in teaching methodology after getting feedback on course evaluations and improvements in the higher education leadership decision-making process after post implementation of ERP systems, while the fifth sub question was used to guide the qualitative and quantitative research on the management decision making.

1.6 Personal and Practical Reflections

The research is very much relevant to my area of interest and important in terms of local context. At my university, as Registrar, I have been involved with the implementation of ERP systems from the beginning (Nizamani, Khoumbati, Ismaili, & Nizamani, 2014). I have a close coordination and working relationship with the other universities where HEC has implemented ERP as a pilot project. These contacts have helped me to collect data from the selected university for data collection. The results of this research study will provide guidelines to university stakeholders and all interested groups for the future expansion of ERP in publicly-funded universities in Pakistan by the HEC.

As a researcher I adhere to standard norms, ethical values and a code of conduct during all steps particularly during gaining access to participants, the collection, the analyzing and interpretation of data (Chuang and Chen, 2006). Participation in the research was voluntary and all personal names and university names were removed to ensure confidentiality. All the communication with the participants was done through my Liverpool Email ID on group domain email IDs of the participants.

Sharing the results with important stakeholders in Pakistan can create the research impact; as well as publishing of the findings in reputable research journals (Tashakkori & Teddlie, 2010). In addition to above the implications drawn from the research work may

be used to inform HEC for larger implementation of ERP systems in public universities in Pakistan.

1.7 The Organization of the Thesis

This thesis is comprised of six chapters. Chapter 1 provides a brief introduction to the background of the study along with the research problem related to ERP systems in higher education. The chapter also outlines the research aim and objectives, research questions and sub-questions and the structure of the study. Chapter 2 is a contextual chapter that starts with the literature review for this research study, the background of the research study, an overview of the higher education setting in Pakistan, an evaluation of ERP systems, an overview of ERP systems in higher education and ERP systems in higher education of Pakistan. This chapter discusses the benefits of ERP in higher education and ERP support in the teaching, learning and decision-making processes. It provides an in depth analysis of the relevant literature on ERP systems in general with a particular focus on ERP in higher education illustrating the different approaches to the evaluation of ERP systems, leading to different IS success research models. This chapter concludes with a comparison of different IS research models in the chapter summary. This then leads into the following chapter where these models are explained further.

Chapter 3 provides a thorough rationale for the research design, followed by the research methodology and research paradigms employed to conduct this study. This chapter explains the research theoretical model and starts with an introduction and reviews of frameworks used for investigating ERP systems. This chapter includes the final factors chosen from the research model to empirically evaluate the impact of ERP systems in higher education. It discusses the research methods, sampling and data collection techniques, the survey methods, the instrumentation employed in data collection and data analysis of the quantitative and qualitative data. Details of the pilot study used and the ethical considerations of the study are also discussed.

Chapter 4 provides the empirical findings of the study that encapsulate both quantitative and qualitative research methods. It explains why the study employed an explanatory sequential research design and why the first section covers the quantitative

findings of the study, whereas the second section discusses the qualitative results. The empirical outcomes from both quantitative and qualitative data analysis are presented separately. Chapter 5 provides an extensive discussion on the quantitative and qualitative findings of the study in relation to the literature and the theoretical model. This discussion consists of mixing of both quantitative and qualitative results and different suggestions based on the empirical results of the study and for support of literature. Chapter 6 consists of the research conclusions and details the significance of the research. It also covers relevant contributions to knowledge in theory and methodology. The chapter also provides the contribution made to policies and practices, limitations of the present study, recommendations for practices, future research directions and personal reflections.

Chapter 2-Literature Review

2.1 Introduction

This chapter provides an in-depth review of the existing literature and reports related to enterprise resource planning in Higher Education. Initially, it discusses the evolution and shift of the ERP research from industries to higher education institutions. The study reviews the extent of the literature related to the use of ERP in higher education institutions and establishes the research gap in the use of ERP in higher education institutions related to improvement in academic processes.

An ERP system is the most widely accepted option to gain a competitive edge and increase the efficiency and transparency through the seamless integration of all information flowing through different departments of a university (Seo, 2013; Soliman & Karia, 2015).

Despite this perceived positive impact of the ERP system in higher education institutions, implementation and integration is considered to be a costly and complex solution (Soliman & Karia, 2017). This has led to the need to evaluate the system from a stakeholder's and technical perspective (Rani, 2016). The previous research studies on similar topics are related to pre or post implementation issues related to the stakeholder's perspective or the input by technical people (Rabaa'i, Bandara, & Gable, 2009). Few studies have reported on the critical success factors (CSFs) related to the implementation of the ERP systems life cycle, nor on the academic advantage that the system implementation might foster. The researchers do not have a common agreement as to which CSFs are important, but most studies suggest that the issues related to top-management support, technical support, training for users, education level of the users and organizational culture are important factors in a successful ERP systems implementation (Al-Sabaawi, 2015; Soliman & Karia, 2017; O'Reilly, Healy, Murphy, & O'Dubhghaill, 2017).

There are few studies that have reported the success ratio of the ERP systems implementation in higher education and analyzed the factors and reasons of failure of such systems. Wong, Scarbrough, Chau and Davison (2005) reported that the failure rate in ERP at the implementation stage is 40 to 60%. However, researchers have different

definitions of failure. One such failure has been defined as expected Return on Investment (ROI) achieved as estimated at the time of the project approval phase (Ptak, 2000). The critical failure factors reported in the literature are a high turnover of the project team, over-reliance on heavy customizations, poor consultant effectiveness and poor IT infrastructure (Wong et al., 2005; Pooam & Garg, 2013; Seo, 2013). The studies reported in the literature tested and validated the ERP success factors using different theoretical Information Systems (IS) models (Al-Sabaawi, 2015; Soliman & Karia, 2017; O'Reilly, Healy, Murphy, & O'Dubhghaill, 2017). However, the literature reported on the use of different theoretical models to measure IS success, such as: the Technology Acceptance Model (TAM), the Technology-Organization-Environment (TOE) framework, the DeLone and McLean model and the Diffusion of Innovation (DOI). Each IS success model has strengths and weaknesses. The research studies reported that IS success models were used on their own or sometimes in combination with others to measure ERP success in organizations. Hence, the review of the literature in the light of research aims and objectives for this study leads to development of a conceptual model based on the research questions and existing models.

2.2 Background of the Research Study

Higher Education institutions are places of learning and scholarship (Purcell, 2008). An ERP implementation project is considered to be one of the most complex and demanding endeavors in higher education (Soliman & Karia, 2015). The project requires significant commitment of money, time and human resources from all the departments of the HEIs. Therefore, HEI management is interested in evaluating the impact of ERP investment on the improvement of academic related processes (Abugabah, 2010). The HEIs administration and sponsoring agencies are interested in shifting manual academic processes to automated processes and a seamless integration of information flows between different departments of the universities (Seo, 2013; Soliman & Karia, 2015). The faculty members expect that the ERP will improve their academic processes by providing access to information in the form of reports that will help them in their classroom teaching. The students are most interested in online registration in a semester, to see their academic performance, subject related material, attendance in the courses and

financial information (Al-hadi & Al-Shaibany, 2017). Higher Education (HE) management is most interested in the ability to look at the academic progression of individual students, classroom performance, decisions related to award financial support to students and the ability to compare performance of different departments by having data available to do so. The faculty performance is based on academic feedback received from students' evaluation at the end of each semester to see the improvement in academic processes and research profiles (Althonayan & Papazafairopoulou, 2013). This is one of the factors considered in the faculty evaluation process at the end of each semester by university management.

In recent years, higher education has been strongly influenced by global trends, especially an emphasis by governments on the improvement of efficiency and transparency in the processes (Ahmer et al., 2016). To cope with the changing global trends and to increase efficiency in HEIs, the Higher Education Commission (HEC), has implemented ERP systems at eight different universities in Pakistan as a pilot project. In this research, I have investigated the impact of ERP on the improvement of academic and administrative related processes in these higher education institutions.

2.3 Evolution of ERP Systems

During the last decade ERP systems have attracted the attention of both the academic and the business community and it seems that now is the time to discuss the evolution of ERP and its current state (Schlichter, & Kraemmergaard, 2010). The origin of ERP systems lies in the manufacturing industry, where the first Material Requirement Planning (MRP or MRP-I) had been launched in 1960 (Alwabel, Zairi, & Gunasekaran, 2006). As the processor power grew, the demands for software application increased by the manufacturers. At that time a few software computing modules were added into MRP-1 i,e. scheduling, finance & accounting, inventory management and payables (Schlichter & Kraemmergaard, 2010). MRP-I emerged as a computer-based system for managing and production the schedule of any manufacturing industry. MRP was used for scheduling and control systems that provide management with a tool to plan its manufacturing activities, material and supplies for receiving high level of customer satisfaction and reduction in costs (Alwabel, Zairi, & Gunasekaran, 2006).

Following a similar path a new software system called Manufacturing Resource Planning (MRP-II) was developed in 1980 with additional features of optimization of manufacturing processes by synchronizing the materials with the production requirements. MRP-II was the integrated manufacturing management system for effective planning of all the resources of the manufacturing business (Alwabel, Zairi, & Gunasekaran, 2006; Schlichter & Kraemmergaard, 2010).

The term Enterprise Resource Planning (ERP) was first coined in the late 1980s and beginning of 1990s based on the foundation of MRP and MRP-II (Rashid, Hossain, & Patrick, 2002). The ERP used a better support of graphical user interface, allowed use of relational database management systems, support of fourth generation languages, portability on different platforms and integration (Alwabel, Zairi, & Gunasekaran, 2006; Schlichter & Kraemmergaard, 2010).

The ERP systems integrate many business processes, including inventory management, manufacturing processes, distribution, finance, accounting, human resource management, project management, services & maintenance and transformation by providing accessibility, visibility and consistency across the enterprise (Rashid, Hossain, & Patrick, 2002). In the 1990s vendors added a few more modules and functions to core modules and called it extended ERPs. ERP systems have the capability to integrate all the processes and functions of a business unit and provide a complete sketch of an organization (Schlichter & Kraemmergaard, 2010). Thus, the ERP systems can be defined as a software package that integrates all the information across the departments of an organization to automate the business processes (Schlichter & Kraemmergaard, 2010). ERP provides support for business planning to achieve organizational goals and objectives. ERP significantly enhances the internal communication and coordination among functional departments. ERP provides seamless integration of information flowing in various departments and provides the complete picture of the entire organization (Rashid, Hossain, & Patrick, 2002).

2.4 Overview of ERP Systems in Higher Education

Abugabah et al (2015) stated that unlike transactional systems that support specific business activities, ERP systems are information system modules that are

integrated to institutionalize the sharing of organizational data. Organizations worldwide implement ERP's to improve operational efficiency because such systems permit a seamless flow of information across the organization and address the problem of "working in silos or isolation" in organizations. Rabaa'i (2009) discussed the growing number of ERP systems world-wide due to growing government pressure on universities to improve operational efficiency and improve management processes. After 1990 ERP venders have responded with ERP modules that are better tailored to new market segments. In response to that many universities (similar to large corporations) have started replacing their legacy stand-alone information systems with pre-packaged ERP solutions.

In universities the ERPs are no different. An Enterprise Resource Planning System is a software system that processes University-wide transactions on a single software system and on a single database. These multi-functional systems are designed to streamline all functions related to academic and administrative matters. The ERP combines the University level data and processes into one single system. The ERP module used for management of academic processes is the CMS (Campus Management Solution). The ERP systems provide the integration of information for the creation of quality of services that might be measured in terms of the access and availability of information. The ERP systems provide instruments to support HE management in decision-making necessary for strategic planning and control by providing real-time Business Intelligence (BI) reports in tabular and graphical formats (Rico, 2004). The ERP supports the delivery of service to students, teachers and researchers through self-service modules (Sabau, Munten, Bologa, Bologa, & Surcel, 2009).

The ERP system has several modules for handling the different functions in higher education institutions, such as **CMS** (Campus Management Solution), **FCM** (Financial Management), **HCM** (Human Capital Management) and **SCM** (Supply Chain Management) as shown in figure 2. A CMS is an integrated solution that manages the entire student lifecycle from initial enrollment, student records, managing course, student financials, attendance, assessment, course evaluation, finally graduation and alumni relationships. CMS supports different functionalities of the teaching and learning processes. It also supports many alerts to students through a self-service module (Alt, &

Auth, 2010). ERP system modules, workflows and processes were designed to be generic and based on best practices available in the world. However, these are customizable keeping in view the specific workflow requirement of the organization. The integration of administrative functions in the higher education sector spans the integration of student administration, human resource management, facilities management, and financial systems that have in the past been supported by separate legacy systems.

Figure 2: Different Modules of ERP System

The CMS provides functionality that allows management to monitor academic progress of the students for smooth and efficient operations of the HEIs. The CMS has the following commonly used modules shown in figure 3:

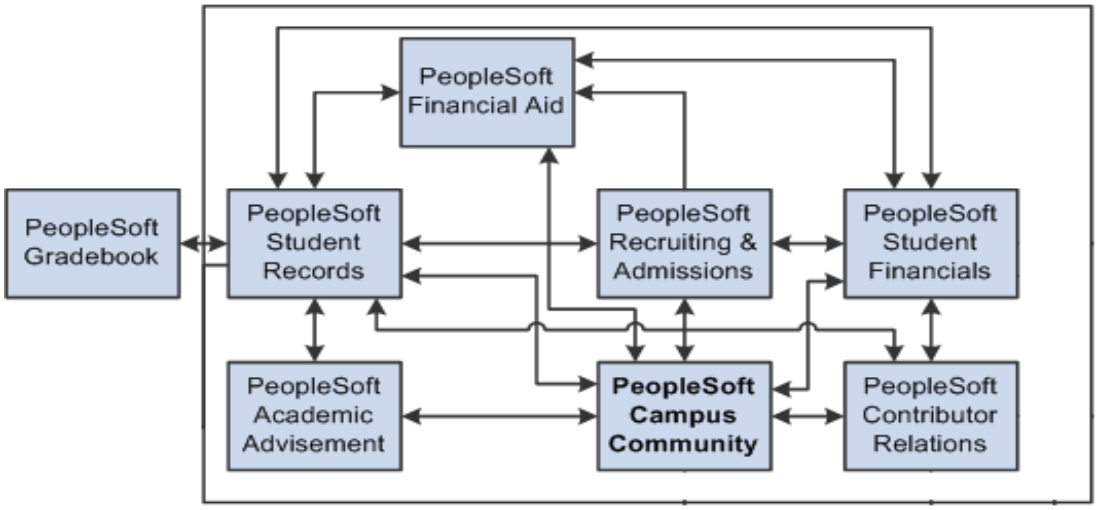


Figure 3: Integration of Different Functions of CMS module

The student admission module is used for automating the complete admission processes of the HEIs. It provides opportunities to apply online and generate merit lists as per admission criteria and admission test results. The student record module provides the interface to the students to register in different courses in a semester. It allows the program officer to carry out term activation and faculty members to generate student attendance rosters and manage student results.

The student financial module keeps the record of each student's financial data. Students can view their dues and generate fee vouchers. This module also handles student scholarships, fee waivers and it generates student alerts.

The curriculum management module is a set of academic processes that maintain a course catalog, schedule of classes, course requisition, withdrawal of courses and academic related activities. The curriculum development and revision is done by the board of studies of each program and then approved by the academic council. The new programs are first discussed at department level and then discussed with external experts in the board of studies and finally approved by the academic council of the university. When the academic council approves these programs they are updated in the CMS/ERP.

The quality assurance is ensured by the CMS/ERP by getting feedback from the students at the start of the course and at the end of the course in a semester. The conciliated reports are shared with concerned faculty members and discussed at management meetings at the end of the semester. The system also generates alerts if the

required number of sessions is not conducted in a particular course or if the number of classes re-scheduled by the subject teacher is high. In that case the final examination of such courses may be delayed until the completion of the required number of sessions (Noaman & Ahmed, 2015). The campus community module provides the opportunity to communicate in an academic community. It maintains the biographical data, service indicators and organizational data.

The gradebook is the main academic module of the CMS that maintains all the academic records of the students, student enrolment, student class assignments, quizzes, exams, grades and faculty evaluation results.

Students and faculty members can access the information through self-service modules as shown in figure 4.

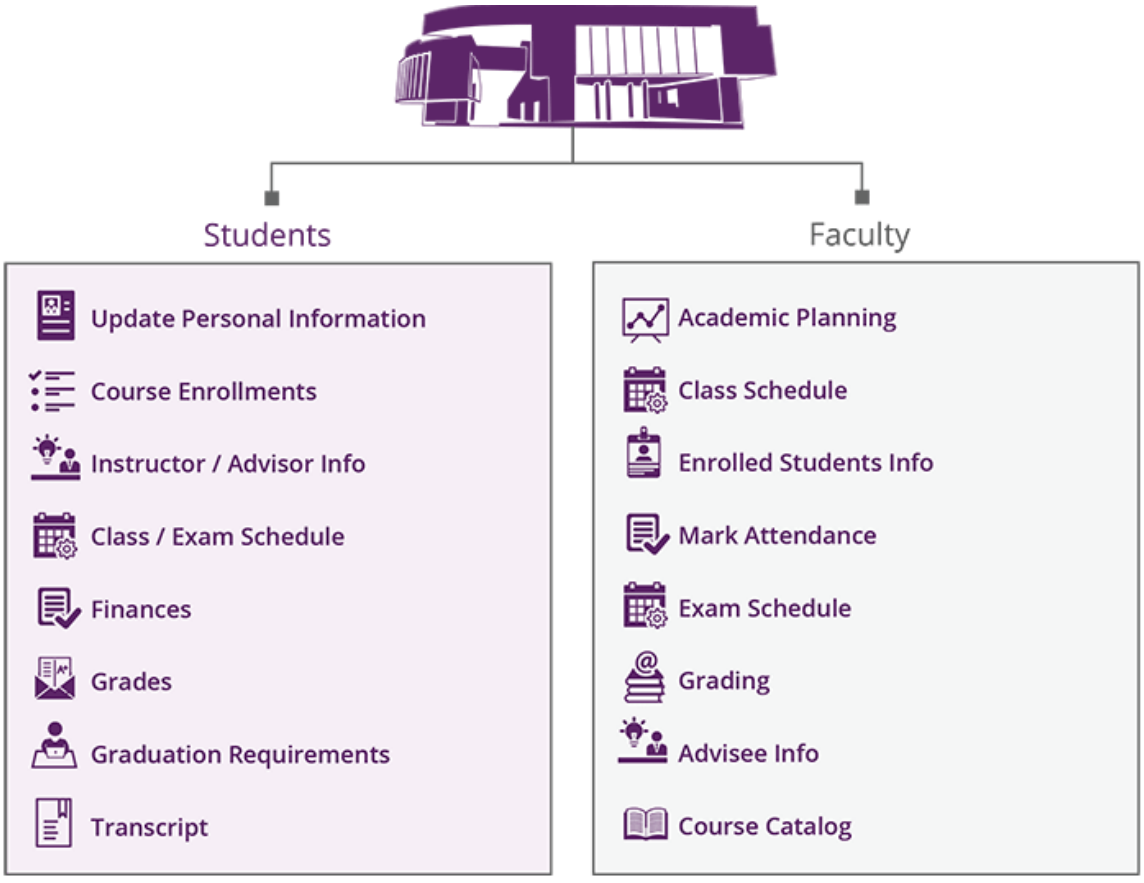


Figure 4: The Self-Service Module for Students and Faculty Members

2.4.1 ERP Systems in Higher Education of Pakistan

The Higher Education institutions are investing substantial amounts in ERP to improve business processes and to gain a competitive edge over their competitors. The worldwide adoption of ERPs in Higher Education institutions has increased rapidly in the past decade (Rabaa'i, Bandara, & Gable, 2009). Lodhi (2016) identified the problems that organizations encounter during the implementation of ERP systems, which may lead to failure of the processes, the expectations from the system and the user interaction. Thus, it is important to analyze the research studies to identify the critical success factors in the implementation process of ERP systems. Lodhi (2016) mentioned that ERP implementation has three different stages: pre-implementation, implementation and post-implementation. The majority of the research studies addressed the issues related to the pre- implementation and implementation stages of the ERP system (Lodhi, 2016). There are a few studies, which report the post-implementation critical success factors of ERPs in HEIs. Most of the studies reported in the literature are based on ERP implementation in the western context in the developed world. Ndung'u and Kyalo (2015) studied the implementation experience of ERP systems at selected public universities in Kenya. The study recommends a continuous review of the implementation efforts in public universities, to ensure better service in line with respective institutional strategic objectives. The study further suggests ERP deployment may be taken when sufficient CSFs are addressed to a level in the successful implementation of an ERP system. Alzoubi (2016) mentioned that ERP success has not been widely studied in the context of regions other than developed regions. There is a need to apply the IS theories and identify CSFs in developing countries such as Pakistan. The successful implementation of ERPs in Higher Education institutions is carried out differently in developing countries such as Pakistan as the CSFs are different than in developed countries. Quire some research on CSFs in ERPs implementation is reported upon in the literature. The main objective of this present research study was to explore the post implementation impact of ERP on different academic processes that could change the level of ERP success (Kronbichler, Ostermann, & Staudinger, 2010). The most important Critical Success Factors (CSFs) identified in the literature are ownership and support of the institution top management, effective project management, identification of clear goals and objectives, the selection of

the ERP, data accuracy and end-user motivation and training (Rabaa'i, Bandara, & Gable, 2009; Lodhi 2016). The research studies identified budget, time and scope of the project as main measures for ERP project success. Bhatti, & Jayaraman (2008) identified CSFs for effective implementation of the ERP system as: top management support, accurate planning, data accuracy, end user training and consultant selection and involvement. CSFs are considered factors that influence the success of the ERP project. The literature on CSFs has been important to understand these factors in developing my enquiry questions because this research investigated the impact of ERP after successful implementation of ERPs in HEIs.

Lodhi (2016) proposed an evaluation framework based on DeLone & McLean's IS model to evaluate the implementation of ERP in corporate organizations in Pakistan. However, higher education institutions have different needs and requirements when compared to any industrial or manufacturing organizations. When looking at the traditional ERP systems, these have some basic modules, for instance dealing with HR (Human Resources), finance, procurement, logistics, sales and marketing, which might be useful to HE. Moreover, the HEIs require ERPs with some peculiar functions related to student administration, courses administration, scheduling/ timetable/ attendance and other applications which are not the requirement of manufacturing or any other organizations; so subsequently, Critical Success Factors also needed to be adapted (Khan & Sarwar, 2014; Bhatti & Jayaraman, 2008; Lodhi, 2016).

The Higher Education Commission (HEC) of Pakistan is an independent, autonomous constitutionally established institution responsible for primary funding, monitoring and accrediting of the programs of the higher education institutions (HEC, 2016). The literature reports few studies on the critical success factors on the pre and post implementation of the ERP modules in higher education (Nizamani et al., 2014; Lodhi, 2016; Sadiq, 2016). The literature does not show examples of implementation of these modules that would help to study the impact of ERP investment on the improvement of the academic and administrative processes of the HEIs, especially in Pakistan, as this is a new development. There is little research done to study the impact of CMS modules of the ERP on academic processes (Nizamani et al., 2014). Nizamani et al. (2017) proposed an ERP success model based on DeLone and McLean (1992) IS success model. The

study provides the knowledge about the success factors for the implementation of ERP in HEIs. It proposed a complete model to measure and evaluate the success or failure of ERP implemented in Pakistani Universities (Nizamani et al., 2017). This suggests that for an empirical study of information systems success the commonly cited model of DeLone and McLean is a suitable one. The literature shows that the DeLone and McLean model is commonly used for information studies with a mixed methods approach to explore research problems deeply. A review of the literature shows that the studies on ERPs in HEIs are mainly conducted to measure the efficiency of the system, or to examine the CSFs of post implementation of ERPs (Nizamani et al., 2014; lodhi, 2016; Sadiq, 2016). The main business of HEIs is teaching, learning and scholarship. There is hardly any study that measures the impact of investment on ERP in HEIs with an emphasis on the support of the academic processes and higher education leadership decision-making. Moreover, there is a noticeable research gap in the proposed area of research in HEIs in Pakistan (Nizamani et al. 2017; Khan, & Sarwar, 2014; Bhatti, & Jayaraman , 2008; Lodhi 2016). Abugabah et al. (2015) conducted similar studies in Saudi Arabian universities and found that system quality, task technology fit and information quality were the most important factors to lead to better user performance. This supports the idea that such study would be valuable in the Pakistani HE context.

2.4.2 Benefits of ERP in Higher Education

The ERP systems for higher education were developed in order to support the key academic and administrative services (Althonayan & Papazafairopoulou, 2013). Despite the challenges faced in the successful implementation of the ERP system, the last decade witnessed remarkable implementations of ERP systems in higher education (Noaman & Ahmed, 2015). A substantial number of higher education institutions have implemented ERP systems in order to improve their operations and make themselves manageable and transparent (Zornada & Velkavrh, 2005). The ERP vendors also expanded ERP solutions to better cater to the needs of the HEIs. The number of research activities reported in the literature shows a high failure rate in the implementation of ERP systems (Graham, 2009; Seo, 2013). It is suggested that the reasons for such failure are manifold and include, lack of clearly defined strategic goals, lack of interest and poor support from top management, resistance from end-users to accept change, poor quality of business process re-

engineering, poor hardware infrastructure, overreliance on heavy customization and un-trained IT support staff (Zornada & Velkavrh, 2005; Noaman & Ahmed, 2015). However, research by Althonayan and Papazafairopoulou (2013) suggests major advantages of ERP in higher education institutions, such as an improvement of academic related processes for faculty and students, improvement of the information access for planning and strategic decisions of management, improvement of the communication and information sharing between different departments, and enhanced transparency in different processes. The contradicting research results highlight the need for the monitoring and evaluation of systems implementation.

HEIs have invested huge amounts in ERP implementation and customization to enhance institutional academic and administrative processes (Abugabah & Sanzogni, 2010). However, the research on the topic so far reported that the implementation of ERP at HEIs is difficult and expensive and the risks involved are very high. The return on investment on ERP systems is in the medium to long term range (Zornada & Velkavrh, 2005). Noaman and Ahmed (2015) mentioned that in Pakistan, small-scale research is reported on the implementation issues and efficiency of the ERP systems, which suggest that there might be a lack of research and evaluation of the impact of ERP systems in the university environment. This research has therefore studied the impact of ERP systems on academic processes, teaching, learning, and on the higher education management decision-making processes.

2.4.3 ERP and Teaching and Learning in Higher Education

The worldwide adoption of ERP Systems in higher education institutions has tremendously increased in the last decade. Higher Education institutions (HEIs) are the main target market of the ERP vendors. Soliman and Karia (2015) mentioned that implementation of ERP in HEIs has redefined the academic processes, such as innovation in research, teaching and learning and management decision making.

In HEIs, teaching is correlated with learning. One of the criteria of measurement of good teaching is the amount of student learning occurring. One measure of this is observed in end of course surveys that the students who learned more gave high ratings to the teacher during the student evaluation process (Thawabieh, 2017). The teachers

present the content and support skills and competency development that will enhance the learning of the students in that particular subject domain. Teachers use different teaching methods in higher education depending on the field of study they are involved in and their own preference (Sajjad, 2010). Some of the common teaching methods used in the HEIs are:

1. Lecture Method
2. Group Discussion
3. Project/Problem/research based
4. Role plays
5. Individual Presentations
6. Case study

Some research studies suggest that students rated the lecture method as the preferred teaching method because it provides all knowledge related to the topic, students listen to a lecture attentively, take notes and time saving method, while in growing universities it is also a useful method of teaching as it can be used in large lecture theatres (Marmah, 2014; Sajjad, 2010). Group discussion and case study teaching methods are rated among the best methods towards student-centered approaches (Sajjad, 2010). These teaching methods allow for more participation by the students; more effective learning might be the result. It does not involve rote learning and the method develops creativity and critical thinking ability in the students. Moreover, presentation strategies and role-play teaching methods have the potential to increase the confidence among the students and increase their communication and collaboration skills (Sajjad, 2010). Quite a variety of approaches are available to teachers.

Today's job market values higher-level skills of graduates compared to domain or subject-based knowledge of the students (Barron, & Darling-Hammond, 2008). Graduates must be able to collect, synthesize and analyze the information gathered. They conduct research and work with others in a team to apply that classroom-gathered knowledge for decision making. Graduates must be able to learn how to easily use new changing technologies and adapt themselves for new social, economic and global conditions (Barron & Darling-Hammond, 2008). Students learn effectively when they apply classroom learning to solve real world problems and when they work as a team in

project-based learning, This requires sustained engagement and collaboration. Active learning practices have more significant impact on developing critical thinking, writing and speaking skills of students. Students learn more in a project/problem-based learning environment compared to rote memorization and simple procedural learning (Tomlinson, 2012; Tomlinson, 2008).

During the last decade, traditional learning environments were criticized as these failed to develop required professional expertise among learners (Fleming, 2001). New approaches for teaching and learning such as project-based learning, problem based learning and case-based teaching were introduced to increase teaching and learning (Dochy, Segers , Van Den Bossche, & Struyven, 2005). Due to rapid changes in social, economic and technology development, the boundaries between jobs are blurring and the work environment is being restructured in new ways. Professionals are required to know how to deal with internationalization, how to efficiently use technology, how to communicate and work in a team and enhance the network. One of the primary objectives of the education at institutions of higher learning is to inculcate thinking and problem-solving skills (Elias, 2011; Dochy, Segers, Van Den Bossche, & Struyven, 2005). An ERP system is the most responsive and comprehensive platform that provides support to faculty members to create and organize assignments quickly, use online learning management systems, provide feedback efficiently, and communicate with classes.

2.4.4 ERP Support in Decision Making in Higher Education Institutions

A Higher Education ERP system supports the top management in strategic decision-making in real time and in an integrated way. This will enable HEIs to enhance their operational efficiency and reduce the duplication of resources (Soliman & Karia, 2016). Soliman and Karia (2016) explained that ERP systems are further required to meet the current needs and improve the performance and efficiency in decision-making process in administrative services. Although Higher Education utilizes ERP systems as a support for the improvement of academic processes, like other organizations, higher education is confronted by similar challenges, such as survival in a competitive environment (Bhamangol, Nandavadekar, & Khilari, 2011). The following sections show

the support that is provided by the ERP systems to top management in making strategic decisions.

2.4.4.1 Academic Support to Higher Management in Decision Making

ERP generates Business Intelligence (BI) reports on performance of the faculty members based on the feedback given by the students at the end-of each semester and performance evaluation reports filled out by the individuals and evaluated by the Heads of Departments. The reports generated by the QEC through ERP help institutional management in the next semester planning, courses allocation, and improvement of course content and teaching methodology (HEC, 2016).

2.4.4.2 Student Life Cycle and Relationship Management

ERP has minimized the use of paperwork through real-time access to student data. It also improved the advisory services through consolidation of real-time student data. Automated fees collection and the billing process help to improve the cash flow of the university after implementation of the ERP system (Khan & Sarwar, 2014). Moreover, the students have instant access to their semester results on a real-time basis. The attendance alerts, fee billing and course registrations are automated through self-service accessible through Mobile App. This has improved cash flow of the HEIs compared to the manual system (Alt & Auth, 2010). ERPs enhanced institutional responsiveness to all the stakeholders because of the automated and streamlined enrolment management process and improved end-to-end customer relationship from applicants to become Alumnus. The system supports the alumnus data management, which helps in tracking the progress of alumnus and taking feedback from them for improvement of academic and administrative processes (Alt & Auth, 2010).

2.4.4.3 Scholarship and Financial Management

The ERP system provides real-time data regarding the student financial position and the arrangement of the scholarship for students through different donors. It offers the potential for timely and accurate information provision to donors on scholarships related matters (Alt & Auth, 2010). In addition, it offers options for improved decision making by higher management by providing real-time, accurate, consolidated data and tracking

status against student performance in different semesters and their financial status. The ERP system provides improved efficiency of budgeting and planning processes through cross-organizational financial controls and visibility to top management through Business Intelligence (BI) reports (Khan & Sarwar, 2014; Alt & Auth, 2010).

A public sector sponsored higher education institution heavily relies on government grants. The ERP supports management in improving the effectiveness of the grant administration from pre-award to post-award across multiple quarters during the fiscal year. The system provides enhanced accuracy of spending tracking and timely reporting through grants utilization reports for funding agencies (Hwang & Grant, 2011). These support structures can be invaluable in helping university managers in making their day to day and also their more strategic long-term decisions (Khan & Sarwar, 2014; Alt & Auth, 2010).

2.4.4.4 Human Capital Management (HCM) and Procurement

The ERP completely automates the HCM processes and reduces the cost and automates recruitment, administration, payroll, time management and all HR and legal reports (Alt & Auth, 2010). This module of the ERP helps the top management to make decisions on essential required purchases on time without compromising supplies for the researcher, faculty member, and administrative staff to support academic activities in higher education. The staff and faculty can initiate the purchase requisitions easily through self-service module, which were done manually previously, and were thus time consuming (Hwang & Grant, 2011).

2.5 ERP Research in Higher Education

Very little research has been conducted on the ERP implementation in the higher education institution environment compared to other environments (Abugabah & Sanzogni, 2010). The last decade has witnessed many changes in the higher education environment. Universities are competing in a global environment and their operation is influenced by global trends (Guri-Rosenblit, 2015). The government has put an emphasis on the adaptation of new worldwide strategies by universities to improve their performance and efficiency. In higher education institutions, the stakeholders (parents

and students) have increased expectations of the quality of education, performance and competitive educational environments. In HEIs, CMS module is mainly used by the students and faculty members that support them in academic related processes.

2.5.1 ERP Research Gap in Higher Education

As mentioned before, earlier ERP systems were mainly implemented in corporate business organizations to gain a competitive advantage in technology development. Large numbers of Higher Education Institutions (HEIs) have implemented ERP systems to improve the efficiency and performance of the organization. The Pakistan government invested huge amounts of money in ERP in HEIs in order to improve and integrate administrative and academic processes of the universities. The failure rate of ERP projects is very high despite that the ERP industry has shown significant growth after 1990s (Rabaa'i, 2009). This means that Higher Education Institutions are cautious in how they do implement the new systems.

However, very little research was reported on the ERP in HEIs environment compared to other organizations. The sole purpose of Universities is teaching, learning and scholarship, which are quite different aims than most businesses have. This made it disappointing that there was only a very low level of research conducted in the possible educational benefits of ERP in higher education. The literature review found hardly any research work that studied the impact of ERP in higher education to support academic processes and higher education management support in decision-making process (Abugabah, Sanzogni, & Alfarraj, 2015). This study provides an opportunity to fill the research gap in the area particularly in my own context.

2.5.2 Critical Success Factors (CSFs)

The literature indicates that research in ERP systems in HEIs have solely placed focus on two phases; pre-implementation and implementation (Soliman & Karia, 2016). Less research has been reported on post implementation success of ERP systems in HEIs and their impact on support of academic process and decision making by higher management. Despite the facts that ERP systems research is wide, there is still lack of empirical understanding in applications of ERP systems in HEIs in the Pakistani context (Soliman & Karia, 2016; Nizamani, Khoumbati, Ismaili, & Nizamani, 2017). Al-

Sabaawi (2005) reports that organizations are implementing the ERP to gain an edge over the competitors, but the ERP implementation success rates are very low and unsatisfactory. ERP implementation success might be increased with end-user participation and involvement in the system development, proper assessment of organizational needs and the process during the analysis phase and data integration at the design phase. The critical success factors have been identified by many research studies investigating the reasons of failure of ERP systems (Al-Sabaawi, 2015; Karia & Soliman, 2017). Karia and Soliman, (2017) mentioned ERP benefits that are used to achieve business benefits by using ERP systems that include strategic operational, managerial, ICT infrastructure and organizational benefits. Furthermore, Abugabah and Sanzogni (2010) report on the visible growth in the implementation of ERP systems in Higher Educations Institutions (HEIs) mainly to gain a competitive advantage.

Moreover, O'Reilly, Healy, Murphy and O'Dubhghaill (2017) identified seven Critical Success Factors (CSFs) for implementing ERP systems in HEIs: (i) Support and commitment of top management (ii) Effective communication between different stakeholders (iii) strategic vision of the leadership (iv) Resources and Skill set for implementation (v) Organizational culture (vi) Organizational readiness (vii) Project selection prioritization.

The research studies discussed above mainly highlight the issues related with pre and post ERP implementation including top management support, acceptance of change, commitment and support of leadership, and effective communication (Awad, 2016). Soliman and Karia (2015) discussed the competitive edge gained by the HEIs after the implementation of ERP systems and suggested that the HEIs main reason for implementing the ERP system was to systemize and integrate the business, administrative and academic processes to replace their existing legacy practices (Soliman, & Karia, 2015). They identified a number of tangible and intangible benefits of ERP systems in HEIs if implemented carefully. ERP system benefits for management are: improved information access for planning and strategic management of HEIs, easy access to information at one place, improved service to faculty, students, employees, parents and alumni and improved operational efficiency and transparency in the systems. These studies suggest possible advantages of introducing ERP systems in HEIs; the following

section will compare and contrast the different theoretical models for IS success research studies.

2.6. Different IS Success Research Models

After the 1990s the Information Systems research community has focused their research efforts on the development and testing of frameworks that will help in investigating the impact of IS in the different organizational environments. A number of theoretical frameworks has emerged that are being used to measure the impact of IS, utilization of systems, system success and user acceptance (Abugabah, Sanzogni, & Alfarraj, 2015). The most commonly reported IS models in research are the Technology Acceptance Model (TAM), Task-Technology Fit (TTF) and the DeLone and McLean (D & M) model (Althonayan & Papazafairopoulou, 2013; Al-hadi, & Al-Shaibany, 2017; Abugabah, Sanzogni, & Alfarraj, 2015; Bousbahi & Alrazgan, 2015). Each model contains different aspects on the impact of IS or benefits to end-users in comparison with this study's research goals and research questions (Abugabah, Sanzogni, & Alfarraj, 2015). Each model considers the impact of Information Systems on end user performance using a different perspective and tells the part of the story relevant to the particular research. Few researchers are suggesting the integration of more than one model into a combined model for deeper investing the impact of IS on organizations. The DeLone and McLean (2003) model concentrates more on System Quality (SQ), Information Quality (SQ) and Service Quality (Sr Q), use, user satisfaction measured against user performance and Net-benefits to the organizations (DeLone, & McLean, 2003). TAM focuses on Perceived Usefulness (PU) and Perceived Ease of Use (PEOU) and their effects on systems use and user performance in organizations (Davis, 1989). In comparison TTF focuses more on the fit between the task requirement and information systems capability. The next section is used to discuss the strengths and shortcomings of these models in the current literature and tries to identify the gaps and areas for further contribution. It ends with a table to clarify the differences.

2.7 Comparison of Information Systems Success Models

Several Information System (IS) and ERP success models are reported on in the literature. The above-mentioned three models will be discussed in detail in the following subsections.

2.7.1 Task Technology Fit (TTF)

Goodhue & Thompson (1995) defined the Task Technology Fit as " the extent that technology functionality matches task requirements and individual abilities" (p.1829), while Goodhue et al. (1995) suggest it involves" the degree to which a technology assists an individual in performing his or her portfolio of tasks" (p.216). The TTF model indicates that performance will be enhanced when technology provides features and supports that fit requirements of tasks or needs of the user (Goodhue et al., 1995; Mihai, 2017). The relationships between technology, organizational processes and performance are of great interest to IS researchers (Gebauer, Shaw, & Gribbins, 2006). The TTF model provides comprehensive technology to a performance model that includes information technology, task and individual user as explanatory variables or technology use and individual performance (Gebauer, Shaw, & Gribbins, 2006).

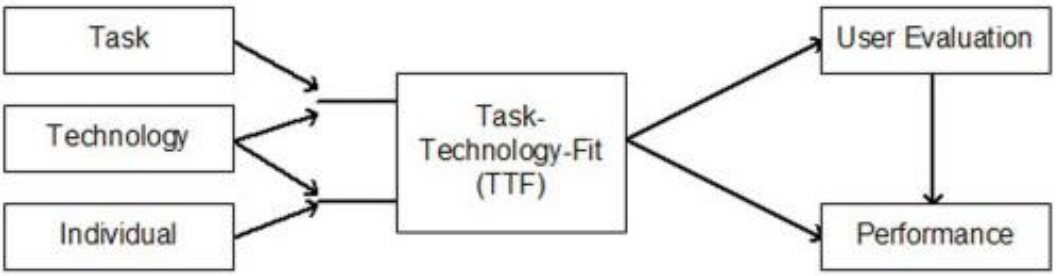


Figure 5: Task-Technology-Fit model (TTF) Source: (Goodhue & Thompson, 1995)

Figure 5 presents the Task-Technology-Fit model (TTF). Tasks are actions that are carried by individuals to convert inputs into outputs. The **task characteristics** of interest include those that move a user to rely heavily on certain aspects of information technology. **Technologies** are viewed as tools used by the individual users in performing specific tasks. In terms of IS research, the technology refers to computer systems (which

include data, software and hardware) and user support (training, helplines, etc) for performing tasks (Goodhue and Thompson, 1995). **Individuals** use the technologies to assist them in performing tasks. Characteristics of the individual (such as training, motivation, IT skills) could influence how the individual will utilize the technology (Goodhue and Thompson, 1995). Task-Technology fit (TTF) is the degree to which technology assists an individual in performing a group of tasks. TTF represents the correspondence between task requirement, individual abilities and functionality of the technology (Gebauer, Shaw, & Gribbins, 2006; Goodhue and Thompson, 1995). The TTF model came with important factors that suggest that technology has a positive impact on the individual performance, especially if the user capabilities have been matched with the tasks the user performs. Measuring this type of capabilities is missing from the following TAM and D& M IS models. The empirical research studies suggest that TTF and usage together can explain the higher-level impact of the ERP performance on individual task performance, rather than usage alone (Mihai, 2017; Gribbins, 2006; Goodhue and Thompson, 1995).

2.7.2 Technology Acceptance Model

The most commonly reported theoretical model in the IS field by researchers is the Technology Acceptance Model (TAM). TAM predicts the use and acceptance of information systems and technology by individual users (figure 6). Davis (1989) developed TAM that is considered as one of the most influential research models to determine IS/Technology adoption at individual level (Al-Mamary, Al-nashmi, Hassan, & Shamsuddin, 2016). The main variables of TAM are perceived ease of use and perceived usefulness (Davis, 1989; Al-Mamary, et al., 2016). TAM suggests that the acceptability of an information system is determined by two main factors i.e. perceived usefulness and perceived ease of use (Lee, & Kim, 2016). TAM determines the relationship between external variables, perceived usefulness (PU), perceived ease of use, attitude toward use and actual usage (Manchanda &Mukherjee, 2013; Davis, 1989). TAM factors (PU and PEOU) lead to a consequently significant effect on the User's behavior toward the actual system's use that ultimately affects the system's impacts and effects on user performance (Abugabah, 2010).

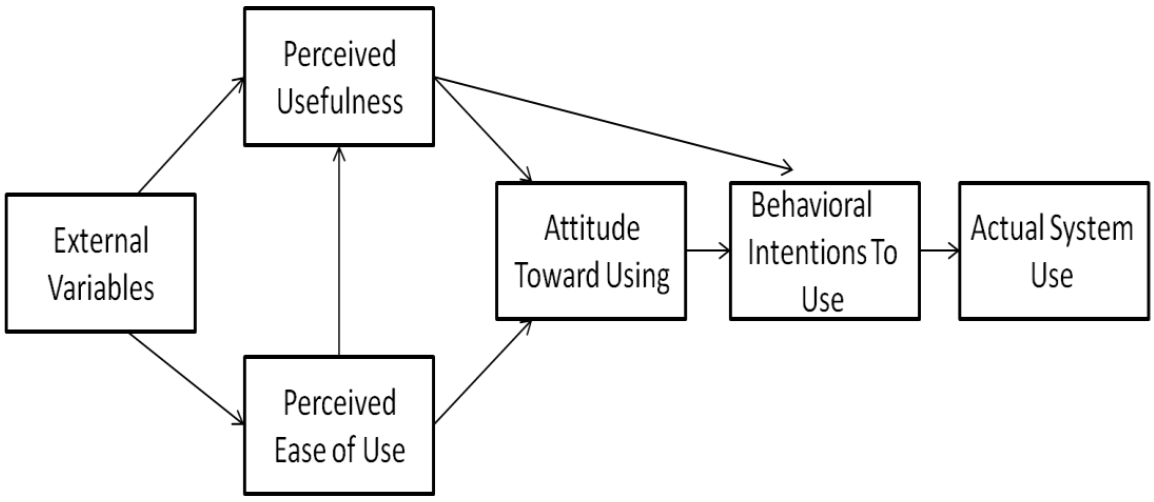


Figure 6: Technology Acceptance Model. Source: Davis (1989).

Research studies reported (Abugabah, Sanzogni, & Alfarraj, 2015; Al-hadi & Al-Shaibany, 2017) that TAM has a limited emphasis on the end-user and this is why it is not considered as a suitable solution for multi-level examination of IS usage. This model provides information on how the design choices affect the user acceptance of the technology. Many research studies applied the TAM model to understand the behavior and attitude of the user toward the ERP systems and measure the degree of satisfaction after using the system (Mihai, 2017). One of the major limitation of the TAM identified by researchers is that the TAM model assumes that users have a choice about the extent to which they use the technology. In contrary to the ERP system the use of the system is mandatory by the end users for the success of the system. The researchers concluded that the traditional TAM model could not fully explain the adoption by users in the ERP context (Al-hadi, & Al-Shaibany, 2017).

2.7.3 Technology-Organization-Environment Framework

A Technology, Organization, and Environment (TOE) framework was developed by Tornatzky and Fleischer (1990) to study the factors that may affect the adoption technological innovation in the organization (Karia & Soliman, 2017; Al-Mamary, Al-nashmi, Hassan, & Shamsuddin, 2016). TOE can be used for studying adoption and assimilation of different types of IS innovations (Al-Mamary, Al-nashmi, Hassan, & Shamsuddin, 2016). Tornatzky and Fleischer (1990) explained that this framework is divided into three dimensions: technology, organization, and the environment. The model

has been reported to be used in IT adoption studies for studying a wide variety of new innovations, such as Knowledge management systems, RFID, IT decision-making processes, Web site e-commerce, Medical Record System (MRP) adoption and ERP systems (figure 7).

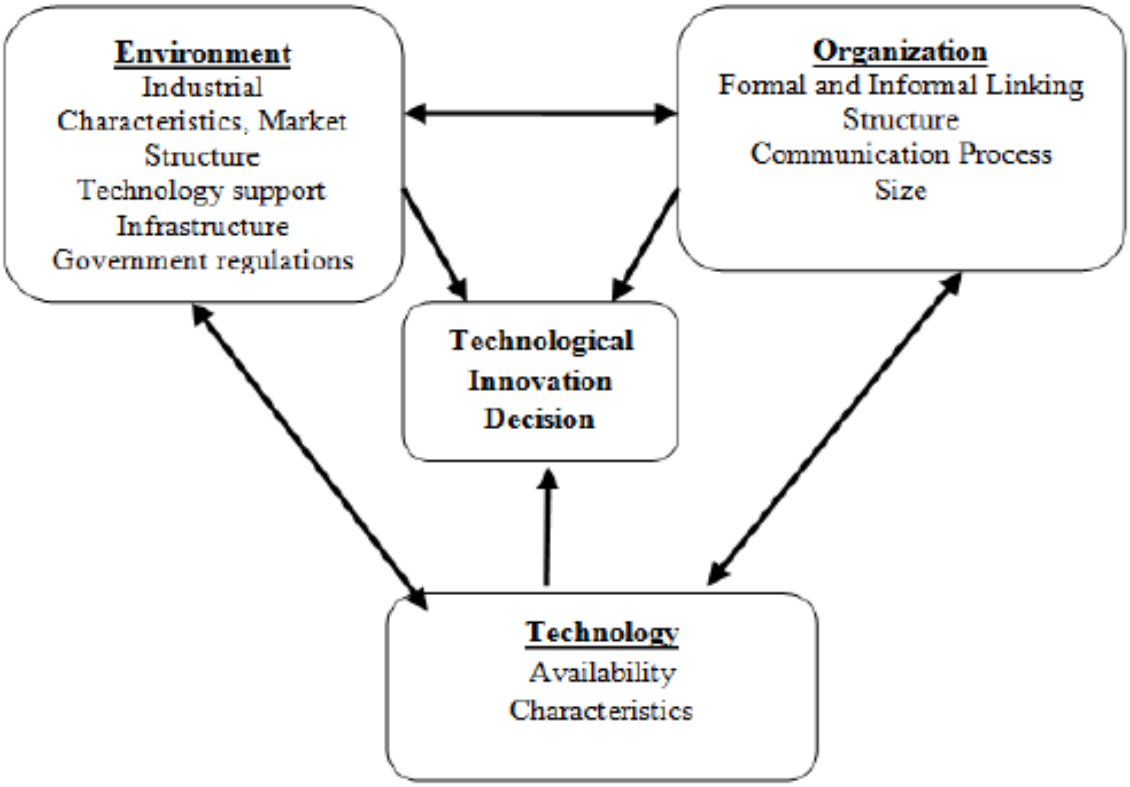


Figure 7: Technology-Organization-Environment (TOE) Framework Source: Tornatzky and Fleischer (1990)

2.7.4 DeLone and McLean's (D & M's) IS Success Model

The DeLone and McLean's (2003) model is the most cited research model in showing information system success and it is considered as one of the best to evaluate the success of IS in the last two decades by researchers in the literature (Zouine, 2015; Lee & Kim, 2016; Ifinedo, 2006; Irawan & Syah, 2017; Chien & Tsaur, 2007). DeLone and McLean (2003) proposed a taxonomy and an interactive model as a framework to conceptualize IS success. Based upon the research published between 1981 to 1987 by Shannon and Weaver, in addition to research conducted previously to measure the success of information systems (Irawan & Syah, 2017), Shannon and Weaver (1998)

classified the information into three levels: technical level, semantic level and level of effectiveness. The technical level of information was defined as accuracy and efficiency of the system that produce information. The semantic level of information was defined as a success in bringing the intended meaning. The level of effectiveness was defined as effective of the information on the recipient (Irawan & Syah, 2017).

D&M (1992) identified six high-levels of IS success. The six dimensions are (i) system quality, (ii) information quality, (iii) use, (iv) user satisfaction, (v) individual impact and (vi) organizational impact (Manchanda & Mukherjee, 2013; Zouine, 2015; Lee, & Kim, 2016) as shown in figure 8. These all are interdependent variables.

System Quality

The system quality defines the degree to which the functionalities of the system can satisfy the needs of the users, with ease and encountering minimal problems. Ullah Baharun, Nor, Siddique, & Bhatti (2017) define the SQ as the technological factors regarding the extent to which Information Systems (IS) are simple to understand and use how the system performs from a technical and design perspective (Ullah et al., 2017).

The System quality defines the system performance, including issues such as data accuracy, system efficiency, response time, etc. The SQ variable is supported by many research studies looking into the post-implementation impact of the end user on the ERP system (Wei, Loong, Leong, & Ooi, 2009; Wang & Liao, 2008).

Information Quality

Information Quality (IQ) refers to the quality of outputs produced either on reports or on-screen with desirable characteristics (Ullah et al., 2017).

Information quality defines the quality of the IS product such as currency, relevance, reliability and completeness.

System Use

The ‘use’ defines the frequency the information system was being used for examining factors like number of functions used, frequency of access and amount of connecting time.

User Satisfaction

‘User Satisfaction’ defines the satisfaction level as reported by the system users, overall satisfaction and interface satisfaction, etc.

Individual Impact

'Individual Impact' defines to measuring impact brought about by the IS on individual users. For example, change in productivity, the decision model and decision-making. **Organizational Impact** defines the changes caused by the information system to the organization, for example decrease in costs, saving in labor cost and growth in profit (Chien & Tsaur, 2007).

The above-mentioned quality factors are used as a basis to achieve a better understanding of the ERP systems. The ERP quality factors are used singularly or in conjunction to study the overall system acceptance, adoption and utilization. Over the years, many researchers in IS studies applied the system quality, information quality and service quality to explain the ERP success in different settings. This is the main reason for the selection of these quality factors to answer the inquiry questions in hand (Ullah et al., 2017; Mihai, 2017). The system quality reflects the picture of other constructs used in different models, such as "perceived ease of use", which is very widely used in different IS studies based on the Technology Acceptance Model (TAM) (Davis, 1989). The D & M IS success model identified the system quality and information quality that have influence on use and user satisfaction that in turn have shaped the impact of system on individual user and on the organization (Chien & Tsaur, 2007). The 'Information' can be measured at different levels, such as the personal level, the technical level, the semantic level and the effectiveness level. At each level, different stakeholders are involved in measuring the information.

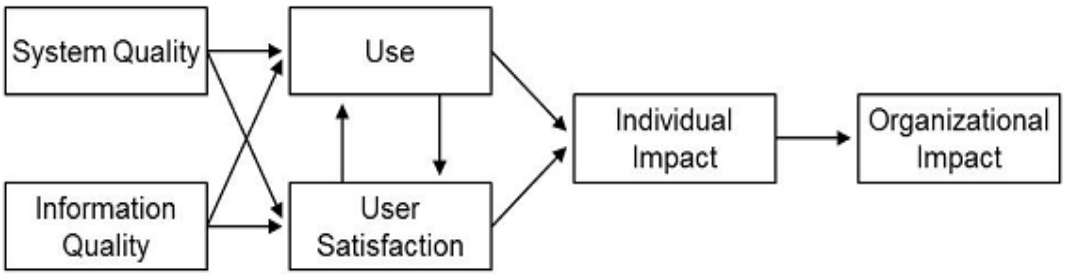


Figure 8: D&M IS Success Model (1992). Source (DeLone, & McLean, 2003)

Keeping in mind the progression that has been made in IS research and development, DeLone and McLean (2003) proposed an updated model in 2003. The updated model is shown in Figure 9. In the updated model, the service quality was added

to the success model and individual impact and organizational impacts were combined into a single new variable ‘Net-benefits’. A successful system will provide benefits to the users of the system such as helping them to do more quality work in the same time or to take less time to do much work of good quality as was done in the past (Seddon, 1997). The research questions in hand are looking into the end-user benefits the system provide to the user. There is a direct relationship between the time spent on using a system and the benefits it provides to the user of the system (Seddon, 1997). The ‘service quality’ measures the service level success compared to the system quality and emphasises more the technology level measures. Service quality is the quality of support that system users receive from the IT department and IT support personnel. The service quality may include factors such as responsiveness, accuracy, reliability, technical competence and empathy of staff. The construct ‘use’ has multi-dimensional aspects in an Information System (IS). Use may be mandatory or voluntary, informed or uninformed, effective or ineffective and a distinction between these can help the researcher to gain a clearer insight in how the IS is used. The DeLone & McLean (2003) model further suggested that ‘intention to use’ may be considered as an alternate measure of IS ‘use’ variable in some contexts. The ‘Net-benefits’ can occur as a result of IS ‘use’ or ‘intention to use’ and ‘user satisfaction’ (Chien, & Tsaur, 2007).

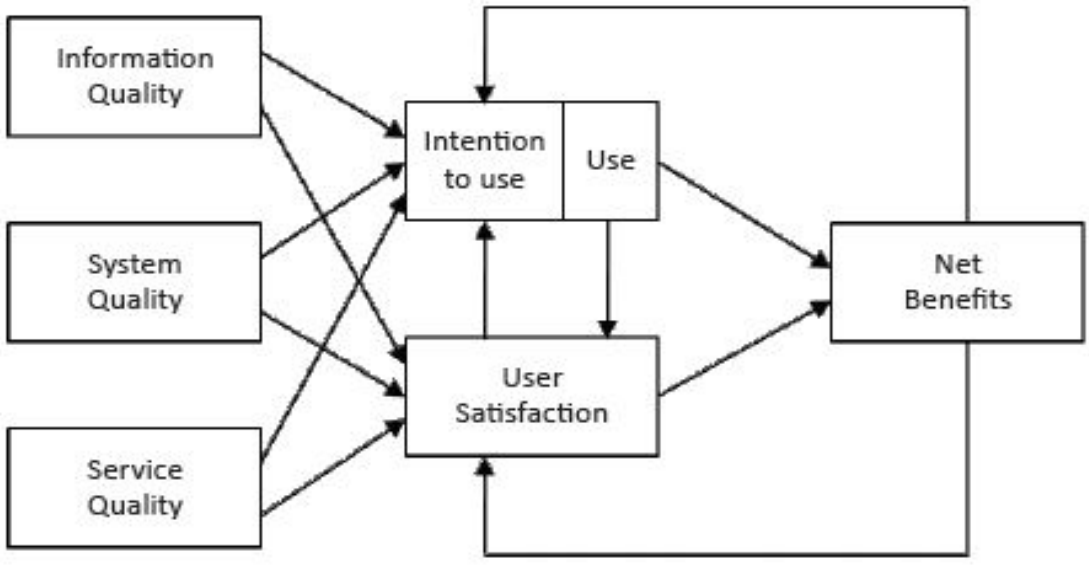


Figure 9: Updated D&M IS Success Model Source: (DeLone & McLean, 2003)

The internal and external factors have to be considered when measuring the impact of the information Systems on the organizational performance. Some researchers have considered them as value of technology investment by quantifiable financial measures such as investment, Return on Investment (ROI), market share, cost productivity analysis and profitability. Other studies reported in the literature investigated the relationship between IS and qualitative measures such as organizational structure, efficiency, change, responsiveness, coordination, flexibility, increase in quality of decision making and improved quality of work life. Few researchers measured the organizational impact as a result of IS function involving measuring the quality of customer service and measuring the amount of resulting competitive advantage. The end-user satisfaction does have a positive impact on organization efficiency (Bradley & Lee, 2004; Rajan & Baral, 2015). Service quality is considered as an important measure for the success of the ERP system. The main users of the ERP systems in the HEIS are students and employees and their satisfaction has a positive impact on the success of the system.

Net benefits are an important success measure as these predict the balance of the positive or negative impacts of ERP system on an organization, while the negative net benefits impact can decrease the intention to use and IS user satisfaction. The investment in ERP represents a significant commitment of resources and negative net benefits have a drastic impact on the academic and operational processes in HEIs (Kronbichler, Ostermann, & Staudinger, 2010) so achieving an understanding of these are useful to the organization. Kronbichler et al. (2010) mentioned that ERP projects in HE went over budget, while a few projects were abruptly discontinued for various reasons. This led to few projects achieving the defined goals after one year of implementation. These issues must be considered during the implementation of ERP projects. For the faculty the time saving and ease of use to support activities would be important factors. For students the quick access to information related to the courses, results, fees and attendance alerts could be perceived as user satisfaction issues that ERP supports compared to a manual system (Petter, DeLone, & McLean, 2008).

All the four models have proven to be applicable in ERP studies of the post implementation impact. Each model has certain limitations. The traditional TAM model

cannot fully explain the adoption by users in the ERP context. The D&M model is widely applied in ERP systems research. The D&M model presumes that system quality (SQ), Information quality (IQ) and Service Quality (ServQ), the independent dimensions of use and user satisfaction indirectly impact on " Net-benefits" which covers both individual and organizational impacts. Many authors of ERP studies found that the D&M model is fulfilling the study of the impact of ERP on individual or organization level to some extent, but sometimes the model has limitations in complex IS situations (Manchanda & Mukherjee, 2013; Zouine, 2015; Lee & Kim, 2016; Livari, 2005).

After in depth analysis of the above discussed models and different IS studies based on the D & M model, it seems that different IS studies have changed the original number of constructs used in the D&M model and evidence is available in the literature to show that various studies employed three or more dimensions against the six dimensions of the D&M model in empirical studies. A number of studies combined the constructs of more than one above discussed model dimensions and came up with a new empirical measurement model. Some studies reduced the different constructs from the D&M model in particular " System Use" and " User satisfaction" with respect to their special context. Gable, Sedera & Chan (2003), for instance, developed four dimensions only with 27 items for the measurement of enterprise system success. Wei, Loong, Leong & Ooi 's (2009) model based on the D& M model replaced user satisfaction, system use, individual and organizational impact with " perceived benefits".

Furthermore, Wickramasinghe and Krunasekara (2012) merged all three of the most cited dimensions of the D&M model into " ERP product performance". Based on the above discussion the empirical model for the present research is discussed in the next chapter.

The summary of all above discussed IS success models are summarized in Table 1 to clarify their connection.

Table 1 Comparison of different IS success models (adopted Kronbichler, S.A., Ostermann, H., & Staudinger, R. (2010, p. 299)

IS Model/Criteria	**DeLone and McLean's (D& M's) Model**	**Technology Acceptance Model (TAM)**	**Task Technology Fit (TTF)**	**Gable et al. model**
Initial Developed	(D & M, 1992,2003)	(Davis, 1989)	(Smyth, 2001)	(Gable et al., 2003)
No. of Different Perspective	6	6	8	5
Suggested Measures	Yes	Yes	No	Yes
Tested in practically used	Yes	Yes	Yes	Yes
Process Model/Casual Model	Yes/Yes	Yes/Yes	No/Yes	No/No
Year of publication	1992/2003	1989	2001	2003
Main Focus of Model	According to authors and literature review the updated D&M IS success model can serve as foundation for positioning and comparing of IS research. The original D&M model was tested and validated by many researchers that show the importance of the model for IS success measurement. The D& M model is useful for success measurement when casual or process dependencies for the measurement of company which is performing the measurement. The model can easily be adopted for specific needs of success measurement (ERP/ E-Commerce) because every success measurement fields needs specific criteria.	TAM considered as first model IS success and IS adoption proposed by Davis(1989) to explain the potential user behavioral intention to use a technological innovations . TAM has been one of the influential models of the technology acceptance. TAM involves two primary predicators: perceived ease of use and perceived usefulness and dependent variable behavioral intention (BI). TAM has been criticized on few grounds: it serves as useful general frameworks and is consistent with number of investigations into the factors that influence older adults' intention to use new technology. TAM model popularity is because of its understandability and simplicity.	The main purpose of TTF is to find out if the systems fits to the requirements of the user which are working with poor fit between system and users can be caused by for example by complex ERP systems implemented, less user involved during the implementation or the background of the user who were working with a system before. That is why TTF approaches should be used to evaluate the system performance from the users point of view, the user's who are working with the system when fulfilling their daily routine tasks. The TTF is used to identify usability gaps and room for improvement of business processes.	The Gable et al. Model is simple approach for success measurement and consists of four main dimensions, which lead to fifth dimension, the "Satisfaction". There are no process or casual dependencies between dimensions. The main difference in between D& M model is that Gable et Al doesn't explicitly consists of dimension which considers the user because the satisfaction as an over changing measure of success rather than as a dimension. This model for the success measurement without any process or casual independencies between the dimensions. Additionally, it consists of the most extensive and complete set of IS measurement tested in a single IS success model.

From the analysis of the different frameworks the D&M model is widely applied in the field of ERP systems research. The D&M IS model provides a useful framework through which ERP post-implementation can be explored in an integrative manner. The D&M model presumes that system quality (SQ), information quality (IQ) and service quality (ServQ, through independent dimensions of use and user satisfaction, indirectly influence the " net benefits" construct, which covers both individual and organizational impact constructs. The D&M is most commonly reported IS success model in the literature for ERP studies. This is why it seems this model will be best suited for the proposed research problem (Mihai, 2017; Wang & Liao, 2008; Wei, Loong, Leong, & Ooi, 2009; Urbach, & Mueller, 2011; Shiau, Tsai, Hsu, Cheng, Leu, & Fan, 2004; Ojo, 2017).

2.8 Summary of the Literature Review

Organizations and higher education institutions are investing hefty amounts of money in the implementation of ERP systems. There seems to be a lack of research that shows the impact of ERP on end-user performance and improvement in the productivity in both academia and HE organizations. The research identified some research conducted toward measuring the benefits of ERP in higher education institutions. However, there is very little research towards measuring the impact in academic processes after the introduction of ERP in higher education. This chapter discussed the implementation of ERP in higher education and has highlighted different models that discuss a variety of impact factors. However, the literature suggests that there are gaps in research particularly to measure the impact of ERP systems in HEIs on the improvement of academic processes such as academic support, student life cycle management, scholarship and relationship management and administrative processes such as financial management, procurement and grants and funds management (Soliman & Karia, 2016).

The literature review started with the historic evolution of ERP that started from industry and then extended to its possible impact in higher education for gaining a competitive edge, global outlook and to increase the efficiency and decreasing operational cost. The chapter reviewed the literature related to ERP implementation in higher education and ERP in higher education of Pakistan in particular and it discussed

the various ERP life cycle models and available literature on IS research frameworks. The main objective of my research study is to explore the impact that ERP systems in higher education have for the improvement of academic and administrative processes. The universities implemented ERPs to support the faculty members and students in fulfilling a variety of academic needs. The main aim of the literature review was to identify the research gap in the proposed research area. As guided by the literature and a critical analysis of the previous work, there is less research reported on the study of the impact of ERP in higher education with particular emphasis on support in academic processes and leadership decision-making. This chapter critically analyzed the various IS models including TAM, TTF, TOE and DeLone and McLean IS success model to choose the best analytical framework to use in the research. The next chapter proposes a theoretical framework for this study based on a critical analysis of the above IS models to evaluate the impact of ERP in higher education.

Chapter 3- Research Methodology

3.1 Rationale for Research Design

There are many research approaches available to investigate the implementation of ERP systems in HE, and the selection of appropriate methodologies depends upon the research problem in hand with clear justification for their choice and use. The current study has used the mixed methods approach, as I considered it the most appropriate choice, consistent with the purpose of the research and a good 'fit' with the research questions. I will explain this choice further in section 3.3.4. This chapter presents the research approaches and methods adopted in the study. The chapter discusses the development of the research design, the selection of appropriate research methods and research processes. The subsequent part of the chapter discusses the rationale and justification of a mixed methods approach and is followed by a selection of data collection methods for quantitative and qualitative data collection and analysis, in addition to the sample composition and sample size. The chapter also discusses the ethical considerations and ethical approval process and content validation. The research objectives and research questions related to the current study were explained in Chapter-1 section 1.4 and 1.5.

3.2. Choice of Research Methodology

The research methodology is defined by a set of procedures for collecting, analyzing, interpreting and reporting data in a research study (Creswell, 2013). The Information System research field has evolved in the last three decades and the selection of the appropriate research methodology and methods is a critical process for the design of research in the IS field. The literature suggests different steps for the selection of the appropriate research design (Johnson & Onwuegbuzie, 2004; Creswell, 2013). This includes the identification of an appropriate research paradigm, selection of research methodology and then the selection of data collection methods (Johnson & Onwuegbuzie, 2004). In the following sections the research methodology choices will be explained in more detail.

3.2.1 Research Paradigm

Research is based on the underlying philosophical assumptions about what constitutes 'valid' research and which research method(s) is/are appropriate for the development of knowledge in a given study (Antwi & Hamza, 2015). The selection of the appropriate research methodology depends upon the paradigm that guides the research venture.

TerreBlanche and Durrheim, (1999) noted that the research process has three major dimensions: ontology, epistemology and methodology. Guba and Lincoln (1994) stated that a research paradigm is intrinsically associated with the concepts of ontology, epistemology and methodology. They suggested that a research inquiry should be based on the way the investigator defines the truth and reality, the process in which the investigator comes to know the truth and reality and methodology used in conducting the investigation.

Epistemological and ontological approaches refer to a researcher's perspective of the world and on knowledge; this perception depends upon the context in which they live and carry out research. The research paradigm inherently reflects the researcher's beliefs and views of the world (Guba & Lincoln, 1994). This means that my perspectives on ontology and epistemology are highly relevant to this research, which I will explain further in the following section.

3.3. Research Theoretical Framework

3.3.1. Philosophical Perspectives

The two common epistemological philosophies adopted for social science research are positivist and interpretivist. The most commonly used classification of IS research paradigms divides them into positivist, interpretative and critical theory, depending on the perspective on knowledge. As positivists assume that reality is objectively given and can be described by measureable steps, which are independent of observer and measurement instrument used, their approach is used if there is evidence of formal propositions, quantifiable measures of variables, hypothesis testing and drawing of inferences about a phenomenon from the sample of stated population. Positivism is concerned with uncovering the truth and presenting the truth in empirical means.

Positivists believe that knowledge is objective and quantifiable (Collins, 2010: p.38). In contrast to this, using the interpretivist approach the researcher understands " the world of human experience" (Cohen & Manion, 2011, p. 36) and discovers the reality through participants' views, their own background and experiences (Thanh & Thanh, 2015; Creswell, 2013).

Interpretivist researchers believe that reality is socially constructed and that knowledge is derived from a variety of routes and there is no single correct route or particular method to knowledge. It is theoretically understood that the interpretivist paradigm predominantly uses qualitative approaches to fully understand the contexts (Thanh & Thanh, 2015). Interpretivists see the world through a series of individual eyes and their analysis is based upon the participants' choice and interpretations of reality to encompass the worldview.

In this research study I have used the *pragmatic approach* to investigate the problem deeply and achieve a clear picture of the research problem in hand. Pragmatic researchers accept both value in positivist and interpretivist research philosophies and believe that using the best of both and then triangulate the results will provide the best way to find answer to social science research problems (Gorard, 2017). The positivist paradigm will be useful for the first part of the research for the collection of quantitative data, while the interpretivist paradigm will be used in the second part for the collection of qualitative data. Knowledge of the multiple realities is gained through integration of multiple research methods encompassing both quantitative and qualitative research methods. Through this combination, the researcher hopes to gain a better understanding of the manifestation of the research problem from the views of the research participants to address the research questions completely (Ihuah & Eaton, 2013; Creswell, 2013; Tashakkori & Teddlie, 2010). The pragmatic approach using a mixed methods approach has provided me with the opportunity to do an analysis of the objective and measurable aspects of the research as well as the subjective points of view of different participants in the research study and is suggested to be a good way of researching complex issues (Gorard, 2017). In this study the quantitative data have been collected through a survey of the students and faculty members of two universities. The qualitative data was collected through semi-structured interviews with the faculty members, Heads of Departments,

Deans and the Vice Chancellors/Directors of the two universities. The pragmatic approach has helped me to fully explore the complex phenomenon and provide a better solution to the problem (Shannon-Baker, 2016).

Combining two different paradigms in one study in depth has given me the opportunity to triangulate data and provide a rounded picture and reliable results (Feilzer, 2010). Thus, the study used the pragmatic approach to combine both positivist and interpretivist approaches sequentially. The positivist approach was used in the explanatory part for the collection of quantitative data, and the interpretivist approach has been used in the second phase for the collection of qualitative data. The choice of theoretical model is especially important in the choices made in the quantitative research.

3.3.2. Research Theoretical Model

3.3.2.1. Introduction

The extensive literature review in the previous chapter has been used as a guide to conceptualize a theoretical model of ERP system success in the context of higher education of Pakistan. A theoretical model is used to elaborate important issue to be studied by the researcher. The aim of this section in the methodology chapter's theoretical framework is to critically analyze the available literature in support of different IS theoretical models. Many IS theoretical models have emerged in the last decade. Measurement of the Information systems success has been considered as a very important and critical issue for the organizations implementing the systems. The literature suggests that researchers have introduced many models to highlight factors that make the information systems successful. The most commonly used are the Technology Acceptance Model (TAM), the Task-Technology Fit (TTF) and the DeLone and McLean (D & M) model. These models are much reported on in the literature for providing the theoretical basis for analyzing the factors that explain the Information Systems benefits and their impact on user performance.

The proposed research model is mainly based on DeLone and McLean's IS success model for empirically validating the ERP in the context of HEIs in Pakistan. The conceptual model was tested and validated using the data gathered from student and

faculty member participants to the research of selected universities in Pakistan. The reason of the selection of the DeLone and McLean model is the generalizability and validity reported in a number of significant research studies that would be useful to this study's research context. Nyandiere et al. (2012) studied the implementation of ERP systems in Kenyan Universities and determined the factors that require more funds and resources for successful implementation of system at public sector universities. Daholkar and Date (2017) identified the factors for measuring ERP success in the Indian higher education context. The study identified the technological factor "ease of use" and the organizational factor " top management support" as the key measures for ERP success in HEIs.

The first section analyses these theoretical models and details the development of a theoretical model for the research study to evaluate the impact of ERP systems on higher education practice with particular emphasis on the improvement of academic processes. The next section provides the description of ERP success measurement with its underlying theoretical foundations and proposes cause and effect relationships between the dependent and independent variables that lead to a testable hypothesis to answer these research questions. This chapter presents the development and background of a proposed research model to study the impact of ERP systems in higher education.

3.3.2.2 What Does This Mean for the Current Research Study?

First, the evaluation by past researchers in their literature reviews has led me in the current study to the selection of the DeLone and McLean model of IS success. Second, more and more recent studies have employed this model in various areas such as modeling digital library success (Alzahrani et al., 2019); E-Commerce success (Shukla, Mohanty, & Kumar, 2020; Angelina, Hermawan, & Suroso, 2019; DeLone, & McLean, 2004); Banking sector (Michel, Michaud-Trévinal, & Cocula, 2019); Healthcare (Rahman, 2019); online shopping experiences (Tarhini, Alalwan, & Algharabat, 2019); student monitoring (Riasti & Nugroho, 2019). Despite the extensive attention towards this model, it seems that none of the studies has utilized this model in evaluating the usefulness of ERP with regards to Pakistan, There is not such a comprehensive study

available. Hence the present study employed the DeLone and McLean model of IS success.

This model posits that system quality, information quality and service quality are the major determinants of information success and user satisfaction are perceived as net benefits to have a positive impact on ERP (Lin, Hsu, & Ting, 2006). DeLone and McLean (2003) opined that information system (IS) effectiveness could be measured based on system quality, information quality and service quality. The present study aimed at addressing the research gap by examining the ERP related research in improvement of the academic and decision-making processes. The end-users of the ERP system in higher education are students, faculty members, Heads of departments, Deans and top management of the HEIs. Therefore, the study evaluated the impact of ERP systems in HEIs on the improvement of academic and administrative related processes. Responding to the paucity in the literature; the present study examined how much ease of use and improvement could be provided by the ERP systems implementation compared to manual or old legacy systems in the HEIs before (Soliman & Karia, 2015; Noaman & Ahmed, 2015). The study investigated whether higher management of the HEIs could see any substantial change in the decision-making compared to earlier manual system. Moreover, it intended to find out the effect of the access provided by ERP to faculty and student related data by HoDs and Deans in making academic and strategic decisions. A substantial evaluation of ERP in the academic environment will add to the knowledge in the field of information systems (Rani, 2016).

The third argument to support the rationale of this present study is that the literature revealed that most of the studies used the D&M model for the measurement of ERP systems success. However, these were not related to the support of academic processes provided to the students and faculty members and how these services might be measured.

Therefore, this research study has used a partial extension and specification of the DeLone and McLean model of IS success of ERP systems as their six dimensions are most applicable to HE and my research focus of academic processes and management decision making processes. For HEIs one of the most desired outcomes of implementing ERP systems is to have clear benefits in comparison to older legacy systems. Thus for

HEIs one of the measurements for successful implementation of ERP systems is to have some tangible benefits. Such benefits can be in the improvement of student academic processes, support to faculty in fulfillment of academic activities, student feedback and support to higher management in decisions making (Wei, Loong, Leong, & Ooi, 2009). Senior management having data to base their decision making on.

As mentioned before, the framework for this research is built on the DeLone and McLean IS success model. In this research study the D and M model is slightly modified as the impact of ERP is proxied by user satisfaction and net benefits. This is an addition to DeLone and McLean's model (Seddon, 1997). It was of interest for the present study to find that the research studies used so far indicated that the information quality does not necessarily have any effect on the usage of the system (Nizamani, Khoumbati, Ismaili, & Nizamani, 2017). Moreover, the variables 'use' and 'user satisfaction' were not proven to mutually influence each other as there are challenges with these as highlighted by Petter et al. (2008). Petter et al. (2008) reviewed 180 research articles related to IS success aspects for the period 1992-2007. They mentioned that the frequency of 'Use' may not be the best way to measure IS 'Use'. "Their research has found a significant difference between self-reported use and actual use. Typically, heavy users tend to underestimate use, while light users tend to overestimate use" (Peter et al., 2008, p.241). Furthermore, the use of the mandatory information system cannot measure satisfaction of the system users as suggested by research from Livari (2005). Moreover, Seddon (1997) claimed that the D&M IS success model is ambiguous in the sense that the one-component 'Use' has more than one meaning. This is why several researchers have been looking into the support of the ERP systems provided to aid the end users to enhance performance and efficiency in their work. It assumes that the end-users are already using the ERP system. Furthermore, that user satisfaction is an attitude coming from the recipients and does not happen because of the limitation of implementation of the essential information system. This means that the "system use" of the ERP systems is mandatory to the end-users in Universities. Seddon (1997) argued that "system use" behavior of the end-user is not an adequate dimension of the IS success model. Furthermore, Sedera et al. (2003) and Gable, Sedera & Chan (2008) conducted exploratory studies in the context of ERP systems and empirically excluded "system use" from the success factors. Sedera et al.

(2003) and Gable et al. (2008) further argued that the "system use" is antecedent of IS success and should not be part of an IS success measurement model. This has led to the following research model that will be explained further in the following sections.
The proposed ERP success model below is based on the IS theories in the context of ERP implementation in higher education institutions so far in this thesis (HEIs).

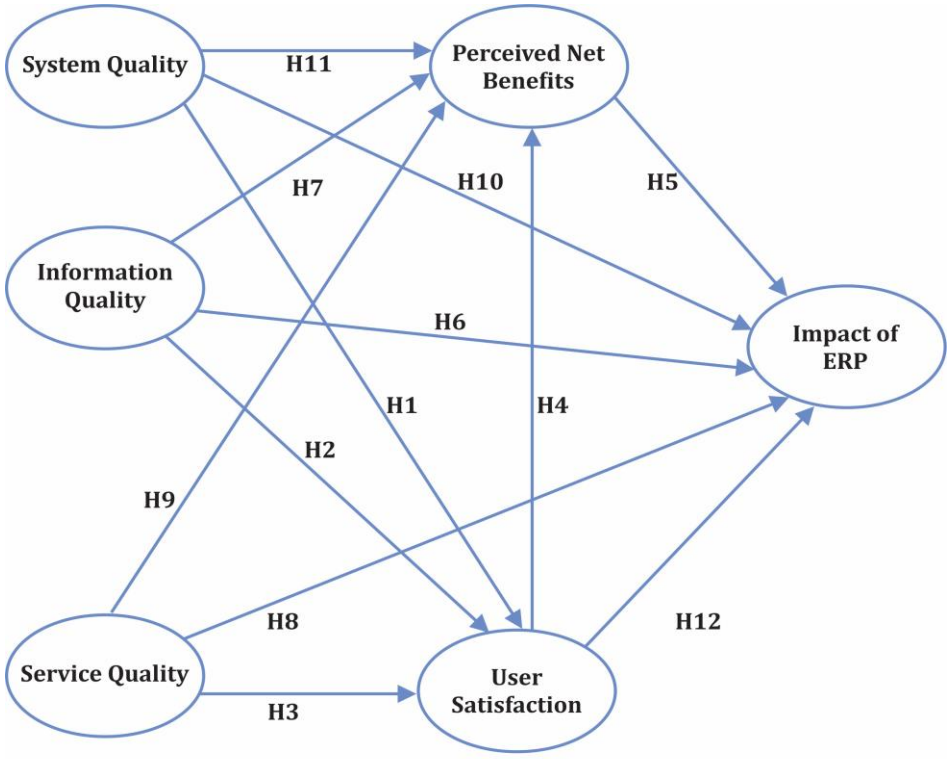


Figure 10: Research Model

The research model posits that system quality, information quality and service quality are three major determinants of user satisfaction and perceived net benefits, which in turn are direct antecedents of impact of the ERP (Lin, Hsu, & Ting, 2006). The study will look into the impact of the ERP systems and their components as suggested above providing support in academic processes and management in decision-making. The overall objective is to integrate all the academic and administrative services and to improve the end-user efficiency.

3.3.2.3. Research Hypotheses

In order to achieve the set research objectives and answer the research questions, a conceptual model was developed, which provides a source of foundation for the research hypotheses. These hypotheses were formulated based on the literature review of pervious studies such as Lodhi et al. (2016), Nizamani et al. (2017), Abugabah (2010). The following hypotheses were developed to test the research.

ERP System Quality - ERP User Satisfaction

The system quality defines the degree to which the system's functionalities can satisfy users' needs with ease and encounter minimal problems. Ullah et al. (2017) describe the SQ as the technological factors and to what extent IS is simple to understand and use how the system performs from a technical and design perspective. The System quality defines the system performance, including data accuracy, system efficiency, response time, etc. Petter et al. (2008) supported the SQ variable by exploring many research studies looking into the post-implementation impact of the end-user on the ERP system. They define ‘User Satisfaction’ as the satisfaction level as reported by system users, overall satisfaction and interface satisfaction, etc. Measurement of user satisfaction is the critical element to measure the impact of the system. User satisfaction is measured in terms of information sharing, feedback, support, and training. Based on the above discussion, the testable hypothesis is:

H1: ERP System Quality is positively associated to ERP user satisfaction

ERP Information Quality- ERP User Satisfaction

Information Quality (IQ) refers to the quality of outputs produced either on reports or on-screen with desirable characteristics (Ullah, Baharun, Nor, Siddique, & Bhatti, 2017). Information quality is defined as the quality of the IS product, such as accuracy, currency, relevance, reliability, and completeness. Nelson et al. (2005) described accuracy as correctness in the mapping of stored information. Completeness is defined as all possible states information can be represented. Currency this refers to the degree in which information is up to date (Nelson et al., 2005).

H2: ERP Information Quality is positively associated to ERP user satisfaction

ERP Service Quality- ERP User Satisfaction

ERP service quality measures are based on the quality of interaction and service provided by the ERP systems. The service quality ensures reliability, availability, information flow, and data accuracy. Reliability means the ability to provide continuity and good service. The literature supports that ERP service quality, in conjunction with system quality and service quality, significantly affects ERP post-implementation success in terms of user satisfaction. Based on the above discussion, the testable hypothesis is:

H3: ERP Service Quality is positively associated to ERP user satisfaction

ERP User Satisfaction - ERP Perceived Net Benefits

Roses (2011) mentioned that the user satisfaction category of the D&M model is one of the most researched categories. User satisfaction discusses training, participation, or involvement in the development section. DeLone and MacLean (1992) linked IS success with user satisfaction because, without user satisfaction, it is tough to claim the ERP system's success. The survey questionnaire was developed to cover information sharing, updated information, improvement in teaching pedagogies, and information integration (Kronbichler, Ostermann, & Staudinger, 2010). From the above discussion, the testable hypothesis is:

H4: ERP user Satisfaction is positively associated to ERP perceived Net Benefits

ERP Perceived Net Benefits- Impact of ERP

'Individual Impact' is defined as measuring the impact brought about by the IS on individual users. For example, change in productivity, the decision model, and decision-making. Organizational impact describes the changes caused by the information system to the organization, for example, decrease in costs, saving in labor cost, and profit growth (Chien, & Tsaur, 2007).

Net benefits are an essential success measure as they predict the balance of the positive or negative impacts of the ERP system on an organization. In contrast, the

negative net benefits impact can decrease the intention to use and IS user satisfaction. The investment in ERP represents a significant commitment of resources, and negative net benefits have a drastic impact on the academic and operational processes in HEIs (Kronbichler, Ostermann, & Staudinger, 2010). For the faculty, the time saving and easiness in their academic work represents the user satisfaction. For students, the quick access to information is related to the courses, results, fees, and attendance alerts could also be perceived as user satisfaction that ERP supports compared to a manual system (Petter, DeLone, & McLean, 2008). As a result of the above discussion, the testable hypothesis is:

H5: ERP perceived Net Benefits are positively associated to the Impact of ERP

ERP Information Quality- Impact of ERP

Information Quality (IQ) refers to the quality of outputs produced either on reports or on-screen with desirable characteristics (Ullah, Baharun, Nor, Siddique, & Bhatti, 2017). Information quality is characterized by the quality of the IS product, such as accuracy, currency, relevance, reliability, and completeness. ERP systems are crucial in HEIs to enhance operational efficiency and competitiveness (Soliman, & Karia, 2016). Thus, accuracy, currency, relevance, reliability, and completeness are associated with the impact of ERP.

H6: ERP Information Quality is positively associated to Impact of ERP

ERP Information Quality - ERP Perceived Net Benefits

Information quality is measured based on the system's quality of output (Wei, Loong, Leong, & Ooi, 2009). This information is in the form of reports. The information quality is measured based on whether the report is usable, concise, comprehensible, relevant, access, and available in the correct format. Based on the above discussion, the following testable hypothesis is:

H7: *ERP Information Quality is positively associated to ERP perceived Net benefits*

ERP Service Quality - impact of ERP

ERP service quality includes all the service that is provided to the users (DeLone & McLean, 2003). The service quality would be measured when the user interacts with the system. This may include data accuracy, information availability, reliability of the information, and information flow within the organization. Based on the above discussion, the testable hypothesis is:

H8: ERP service quality is positively related to impact of ERP

ERP Service Quality - Perceived Net Benefits

The higher education management desires that successful ERP implementation supports academic processes and improvements in decision- making compared to the existing way of doing things (Wei, Loong, Leong, & Ooi, 2009). The higher education management desires that with the successful implementation of ERP linked with few benefits. Such benefits may include improved academic processes, better access to information, improvement in communication and feedback between different departments (DeLone & McLean, 2003). Petter et al. (2008) specify the quality of service that ERP users receive from the ICT department regarding training and support. These are for example, responsiveness, reliability, technical competence, and empathy of the support staff. Based on the above discussion, the testable hypothesis is:

H9: ERP service quality is positively related to perceived Net benefits

ERP System Quality - Impact of ERP

ERP system quality plays a key role in information systems and the technology context. The factors considered are ease of use, access, system features and efficiency, system accuracy, and sophistication (Isaac, Abdullah, Ramayah, & Mutahar, 2017). The relationship between system quality and ERP impact is reported in the IS literature (Petter, DeLone, & McLean, 2008). Based on the above discussion, the testable hypothesis is:

H10: ERP system quality is positively associated to impact of ERP

ERP System Quality - Perceived Net Benefits

Perceived Net benefits are defined as the extent to which the ERP system contributes to individuals or organizations in improved decision-making, managed information, improved academic processes, improved communication, and providing of overall feedback (Isaac, Abdullah, Ramayah, & Mutahar, 2017; Petter, DeLone, & McLean, 2008). Based on the above discussion, the testable hypothesis is:

H11: ERP system quality is positively associated to perceived net benefits

ERP User Satisfaction- Impact of ERP

ERP user satisfaction is considered one of the key factors when IS researchers examine technology usage (Petter, DeLone, & McLean, 2008). User satisfaction is defined as the degree to which users are satisfied with the use of the system to meet their expectations (Nelson et al., 2005). Empirical results depicted a strong relationship between user satisfaction and impact of ERP (Wang & Liao 2008). Wong et al. (2005) found that user satisfaction has a positive effect on the impact of ERP. Thus, based on the above discussion, the testable hypothesis is:

H12: ERP User Satisfaction is positively associated to Impact of ERP

Summary of testable hypotheses:

H1: ERP System Quality is positively associated to ERP user satisfaction
H2: ERP Information Quality is positively associated to ERP user satisfaction
H3: ERP Service Quality is positively associated to ERP user satisfaction
H4: ERP user Satisfaction is positively associated to ERP perceived Net Benefits
H5: ERP perceived Net Benefits are positively associated to the Impact of ERP
H6: ERP Information Quality is positively associated to Impact of ERP
H7: ERP Information Quality is positively associated to ERP perceived Net benefits
H8: ERP service quality is positively related to impact of ERP
H9: ERP service quality is positively related to perceived Net benefits
H10: ERP system quality is positively associated to impact of ERP.
H11: ERP system quality is positively associated to perceived net benefits

H12: ERP User Satisfaction is positively associated to Impact of ERP

3.3.3. Research Methodology and Design

The research methodology is considered as a strategy of enquiry, which moves from underlying assumptions to research design and data collection. The most common research methods are quantitative and qualitative; neither of these methods is better than the other, the suitability of which needs to be decided by the context, purpose and nature of the research questions. There is no definite right or wrong approach to any research but researchers have to employ an approach that offers relevant answers to their research questions or issues under examination. This means that the research design must be aligned with the research paradigm being used in the study and that the correct choice of research design should involve an overall strategy to gain the information wanted and to influence subsequent research activities, what data to be collected and how the data should be collected. As mentioned in section 4.4, in this study I have used a mixed methods approach that uses quantitative and qualitative techniques of data collections.

3.3.4. Mixed Methods Approach

Ratan et al. (2019) mentioned that research questions form the backbone of good research, because these identify the problem to be explored and guide to the methodology. The selected research questions aim to explore and fill in the research gap in an area of concern and generate new knowledge (Ratan, Anand, & Ratan, 2019). As explained in section 1.5 the more general questions (sub-questions one and two of the research study related to the improvement of academic processes) of the research study have been explored in the quantitative part. The qualitative part has explored the third and fourth sub-question related to the improvement in teaching methodology after getting feedback on course evaluations and improvements in higher education leadership decision-making process after implementation of ERP systems. The fifth sub-question was used to guide the qualitative and quantitative research on the management decision-making.

3.3.4.1 Overview of Mixed Methods Approach

Creswell and Plano (2007) defined mixed method as "research in which the investigator collects and analyses data, integrates the findings and draws inferences using both qualitative and quantitative approaches or methods in a single study" (p.4). Research designs and methods used by the researchers in Information Systems (IS) research are broadly classified as qualitative and quantitative. Both qualitative and quantitative methods have their own advantages and limitations (Peng & Annansingh, 2011). In quantitative methods the survey is efficiently and economically used for collecting the data from a large sample spread in a wide geographical area at the same time. However, the survey has limitations in terms of exploration of social context as it collects data at a fairly superficial level. On the other hand, the interview techniques as qualitative tool can be used efficiently for the exploration and gathering of the inside human perceptions and attitudes towards complex social phenomena, although conducting interviews with large numbers of participants may be time consuming.

The literature reported several research studies of a similar nature, which used a mixed methods approach to analyze the research questions more deeply. For instance, Rabaa'I, Bandara & Gable (2009) conducted research to understand and contribute to the ERP adaption and evaluation in HEIs in the Australasian region. Their study used a mixed methods approach to explore its research questions. Sullivan (2009) investigated the post-implementation experience of the ERP system at six HEIs. A mixed methods approach consisting of an online survey and a qualitative case study were both utilized for data collection. A pragmatic approach was used to generate research results and findings. Nizamani et al. (2017) developed a conceptual model to evaluate the success of the ERP implementation at HEIs in Pakistan. The study used a mixed methods approach to evaluate the success and failure of ERP implementation. Moreover, the study suggested that the findings might be useful for future decisions of ERP implementation. This makes these relevant to this study as a similar research approach was used in other articles on the ERP implementation in HEIs (Abugabah & Sanzogni, 2010; Lodhi, Abdullah, & Shahzad, 2016).

Keeping in mind that the inherent limitations of the qualitative and quantitative methods have resulted in the emergence and use of alternative research designs that are

known as the mixed methods approach. The mixed methods approach combines both qualitative and quantitative methods to investigate deeply, the same underlying phenomenon in a single study. This approach is considered as an efficient approach in IS studies as it means that it supplements the weaknesses of a single method design thus leading to deeper findings and higher quality research (Antwi & Hamza, 2015).

3.3.4.2. Benefits of Mixed Methods Approach

Almeida (2018) mentioned that many empirical studies emerged in the last decade that used mixed methods research to profoundly and accurately understand the phenomena under study. Pascal et al. (2018) researched to understand better the use of mixed methods research in Information Systems (IS) researchers. The author proposed selecting a mixed-methods approach for IS authors wishing to implement this type of design. Peng et al. (2011) discussed key determinants of the success of the mixed-methods design depends upon the researcher's ability to combine the quantitative and qualitative elements throughout the project, from the design to integration and reporting of findings. After reading the literature, I am well aware of the inherent limitations of quantitative and qualitative approaches on their own. I decided to use a mixed method approach for the current research to explore a broader and more complete vision of a problem (Malina, Norrelit, & Selto, 2011). In addition, to understanding how and why selected variables impact each other and to measure overall support of ERP system to academic processes and higher management decision making process in HEIs. The use of a mixed methods approach in this study will be efficient in supplementing the weaknesses of a single method and thus provide better findings and high quality research work. If I would have just looked at technical success, for instance, by counting numbers of users this would not have given a full picture, nor, I believe, would have been looking at user satisfaction. However, adding a qualitative strand to the research that also included attitudes towards the use of the information system and the skills and capacities of users of it has provided more in-depth data on people and how they engage with the system.

There are different stages where 'mixing' can be done; at the design stage, at the data collection stage and at the analysis stage. In this study the mixing has been done at the analysis stage where data collected from both the approaches was collected separately

and then integrated to see how these supported each other (Peng, Nunes, & Annansingh, 2011).

The research study in hand has used a sequential explanatory design method. In this design the quantitative data is collected and analyzed first and followed by the collection and analysis of qualitative data, all in one study. The researcher has chosen sequential explanatory design to keep in mind the research questions, the volume of data collected and the literature review (Ivankova, Creswell, & Stick, 2006; Petter & Gallivan, 2004). Explanatory sequential research design removes the personal biases, which are associated when the researcher applies a single method, either quantitative or qualitative (Lodhi, Abdullah, & Shahzad, 2016). The explanatory mixed method design has been used in the research study because it seemed to provide the best fit to answer the research questions, while it also met the overall objectives of this study.

In the first phase data were collected using the quantitative method. The emphasis was placed on the quantitative approach because it would show a clear picture about the impact of ERP in higher education. The qualitative data was then collected through semi-structured interviews from faculty members, heads of departments and members of top management to explore the research questions regarding the support of ERP on classroom teaching and learning and higher management decision-making in more depth.

3.3.5 Data Collection Techniques

3.3.5.1 Sample Size

Sampling is defined as the process of selecting data from the large population for the test and analysis purpose (Lodhi, Abdullah, & Shahzad, 2016). Sharp et al. (2012) stated that sample selection is one of three most important stages in mixed method studies. Teddlie and Yu (2007) divided sampling procedure in two broad groups i.e probability, purposive and convenience. Probability sampling techniques are used for quantitative research studies, which involve selecting a large number of units from the population in a random manner, where the probability samples represent the entire population (Onwuegbuzie, & Collins, 2017). The use of probability samples aims to achieve representativeness, which is the degree to which the sample accurately represents the entire population (Teddlie & Yu, 2007). Purpose sampling is used in qualitative

studies and defined as a technique based on a specific purpose associated with the research study questions (Onwuegbuzie & Collins, 2017). In the mixed methods approach it is a challenge to get a representative sample, that serves the purpose of generalizability of research findings and an in-depth understanding of the research context (Teddlie & Yu, 2007). In the quantitative research, the researcher selects the sample size that is representative of the population so that the results can be generalized to a population, which is what I have done in this study. HEC (2016) has implemented the ERP systems at eight different universities as a pilot project to automate a variety of academic administrative processes.

The Higher Education Commission (HEC) of Pakistan has invested a significant amount of funding to facilitate the customization and implementation of ERPs in 8 of the 138 public sector (HEC, 2016) universities (Dow University of Health Sciences, Karachi (DUHS), University of Engineering and Technology, Peshawar (UET), Quaid-e-Azam University, Islamabad (QAU), Islamia University, Bahawalpur (IUB), Balochistan University of Information Technology and Management Sciences, Quetta (BUITEMS), University of Punjab, Lahore (PU), Sukkur Institute of Business Administration (SIBA), and Institute of Business Administration (IBA), Karachi), as a pilot run in the country. These universities were selected nationwide spread demographically and geographically and successfully implemented similar ERP systems funded by the HEC (2016). I have selected two universities out of eight for the research to keep the research data manageable. According to Khan (2017) “selection of the universities was very diverse, with respect to geographical perspective, size of the university and discipline of the universities” (p.18). The selection of sample universities for data collection was based on easy accessibility and reach to the research study's potential respondents, so an element of convenience sampling was also present. Because eight different public sector universities implemented similar ERP systems supplied by the HEC (2016), the selected sample was representative.

The purpose of this research study was to measure the impact of ERP on academic and administrative support. The target population for the study consisted of the ERP users of two universities who interact with ERP and use the system for performing

different tasks. All students have email IDs on the university domains, which made it easy to communicate with them (Cohen, Manion, & Morrison, 2011).

In research terminology population is defined as a comprehensive group of individuals, institutions, objects and so forth which have common characteristics that are of the interest to the researcher (Banerjee & Chaudhury, 2010). The respondents were selected on a random basis; each participant was different from the other in terms of age, qualification, year of experience, subject area, qualification and number of years of experience of using ERP. The selected universities are situated in the same province where the study has been conducted. The online survey questionnaire was distributed to email groups (for faculty members and students) to three hundred students and two hundred faculty members (target population) of both selected universities for the quantitative research part. In response to the online questionnaire a total of 232 students responded and 141 faculty members also. The response rate was about 74.6%.

Teddlie and Yu (2007) defined purposive sampling as a type of sample in which a particular setting, person, or phenomenon is deliberately selected for some specific information they can provide that cannot be received from other choices. In the qualitative research a purposeful sampling technique (Teddlie & Yu, 2007) was used, which meant that I as researcher selected the participants who had experience with the central phenomenon or key questions being explored, in this case 12 members of faculty and members of senior management. An invitation email was sent to faculty members, Heads of academic departments/Deans and Vice Chancellors of the Universities along with an information sheet, consent form and interview protocol.

The faculty members and HoDs/Deans who responded within the given time and filled out the consent form were selected for an interview. The VCs were personally approached with a personal information sheet and a request for an interview. Participants filled out the consent form.

3.3.5.2. Quantitative Data Collection: Online Survey

An online survey was designed using www.surveymonkey.com to collect data on the post implementation impact of ERP in higher education institutions, and support in improvement of academic processes. The survey (see Appendix-A and Appendix-B) consists of two sections. In the first section there were nine questions related to

demographic information, which included the information about usage of ERP, name of the university, department, age, gender, highest qualification and frequency of use of ERP. In the 2nd section thirty-four semi-structured questions were asked, related to different aspects of the ERP impact on higher education institutions. One was an open-ended question at the end regarding the experience with CMS/ERP use. Two types of survey were designed separately keeping in mind the different usage of ERP by the students and faculty members (see Appendix-A and Appendix-B). The selection of ERP related questions was designed after the literature review of similar studies conducted in the ERP system.

The present research used the online survey tool and the survey link was sent to the participants via email and they were requested to complete the survey. Follow-up emails were sent to the participants to fill the online survey. The average time required to fill the survey questions was calculated as 15 to 20 minutes. All the correspondence was done through my University of Liverpool (UoL) official email id. To avoid any appearance of coercion or influence on the participants the local Pakistani email id was not used.

The survey was piloted before distribution and the survey questions were adjusted accordingly before the official distribution. The survey questions were designed by using the Likert scale, which has frequently been used in survey in IS research over the past 20 years (Chien & Tsaur, 2007). However, the second part of the survey also included open-ended options (see appendix A and B). Based on the nature of this research by Chien and Tsaur (2007), I found it useful to use five levels in the Likert scales (Strongly Disagree, Disagree, Neutral, Agree, Strongly Agree) in the 34 questions survey designed to understand the impact of ERP system on end-user performance.

The first part of the survey was introductory and the participants were requested to fill in the survey form. The Participant Information Sheet (PIS) was attached as a pdf file so that the participants could easily download and read the PIS information. The second part was a consent form, which was a declaration by the participant to participate and answer the survey questionnaires. In the next part, the participants were asked to answer the demographic questions and the questions related to ERP.

The survey was sent to three hundred students and two hundred faculty members via an email invitation. In response to that email, 232 students filled out the online survey and 141 faculty members filled out the forms. After clean up of the data, a total of 230 forms were filled out one 100% correctly, which included 120 student surveys and 110 by faculty members.

3.3.5.3. Qualitative Data Collection: Interviews

Qualitative data was collected through interviews. Interviews were considered as an essential source for the collection of qualitative data from the participants (Frances, Coughlan, & Cronin, 2009). There were three groups of main participants in the qualitative data collection. Faculty members, Heads of teaching departments and top leaderships of both selected universities. The interview protocol was designed with separate questions for faculty members, Heads of teaching departments and top management. A total of twelve interviews was conducted (five faculty members, five Heads of Department and two Vice Chancellors. Semi-structured interview questions were designed because in this approach the researcher has the freedom to follow up points as necessary within given structure.

The interview questions were designed keeping the research questions and sub-questions in mind and were developed after an extensive literature review on similar ERP studies to inform the interview questions, as well as the research questions. Interviews were conducted in a private office and for the interviews at a distance Skype was used. Each interview lasted for about 30-40 minutes. All the interviews were recorded with the informed consent of participants and subsequently the recorded interviews were transcribed in MS word format. The participants were invited by sending them emails and a reminder was sent to participants one day before the scheduled interview session. The interviews were conducted at an already booked meeting room to avoid any influence or coercion. The Skype sessions were also scheduled in meeting rooms. All participants signed consent forms before the conduct of the interviews. All the transcription data was combined into one MS word document based on themes and using proper codification to avoid researcher bias. The interview protocol and consent form of participant are detailed in Appendix-C and D.

3.3.6. Pilot Study

Content validity in research means appropriateness of tools, processes and data (Leung, 2015). Leung (2015) highlights the importance of validity of the research questions for the desired outcome, the selection of the methodology for answering the research questions, the research design for selected methodology, the sampling and data analysis and finally the results for the used sample and context (Leung, 2015). A pilot study was seen to be important before conducting of the actual research. Prior to the actual data collection, a pilot study has been conducted to check the efficiency and effectiveness of the content of the data collection techniques and questions (Creswell, 2013). A sample size of 5% of the actual study has been used to conduct the pilot study. On the basis of the outcome of the pilot study results, the research tools were finalized. The data has been collected soon after getting ethical approval from the ethical review boards of both the universities in Pakistan and the Virtual Programme Research Ethics Committee (VPREC) of the University of Liverpool, UK.

I conducted a small pilot study as a prototype model to evaluate the efficiency of the instruments to be used in testing the hypotheses for the collection of qualitative and quantitative data. The pilot study of the survey was conducted on 10 faculty members and 10 students of both participating Universities. The survey questionnaires were sent to the participants of the pilot study. The suggested changes were incorporated in the final survey questionnaire. The questionnaires were also discussed with the ERP team experts of both Pakistani universities before finalizing.

In this study the selection of questions was derived based on different validated studies (Althonayan, 2013; Creswell, 2013) and my research questions and hypotheses. Therefore, the questionnaires were validated to some extent (Onwuegbuzie & Johnson, 2006). Using the pilot study on the sample participants of the same universities further validated the questionnaires.

3.3.7 Data Analysis

The researcher selected a mixed methods approach to the analyses of the collected data during the research study to answer the research questions earlier raised. As earlier explained in section 1.4 the more general questions (sub-questions one and two of the

research study related to the improvement of academic processes) of the research study have been explored in the quantitative part. The qualitative part entailed the exploration of the third and fourth research sub-questions related to the improvement in teaching methodology after getting feedback on course evaluations and improvements in higher education leadership decision-making processes after implementing ERP systems. Simultaneously, the fifth sub-question was used to guide the qualitative and quantitative research on management decision-making.

3.3.7.1 Quantitative Data Analysis

After the completion of the data collection stage, the data processing was undertaken. For the quantitative data analysis the Statistical Package for Social Sciences (SPSS) Software was used to first clean the data by handling missing values, outlier assessment, normality assessment, multicollinearity assessment, common method variance assessment and descriptive analysis.

Next, the present study employed Partial Least Square –Structure Equation Modeling (PLS-SEM) techniques using the SmartPLS 3.2.8 (Ringle et al., 2015) Software package to conduct validity and reliability tests and to generate path coefficients. PLS-SEM has become a key approach for validating the conceptual models across many disciplines in general and Information Systems in specific (Al-Emran Mezhuyev, & Kamaludin 2019). The details of data analysis and findings are discussed in chapter-04.

3.3.7.2 Qualitative Data Analysis

The qualitative component of this study has involved an exploration of the research questions more deeply through the qualitative perspective. The research question numbers four and five (What, if any, might be on the impact of semester end of course evaluations in the ERP systems from a faculty perspective? And what are the improvements in higher education leadership decision-making after the implementation of ERP systems from a management perspective?) were explored through an analysis of the qualitative data. As discussed in Chapter 3, the qualitative data was collected through twelve semi-structured interviews with faculty members, heads of department and VCs.

(The interview protocol and consent forms of participants are detailed in Appendix C and D).

The qualitative data was collected through the audio recording of face to face and Skype meetings where participants were interviewed. The conversation during the interviews took place in the English language. All the audio-recorded interviews were transcribed in MS Word format to ensure data accuracy and to enable a better collection and analysis of the evidence. The transcription was sent back through email to the interview participants for verification. After verification, data coding was carried out and each faculty member was assigned a code, such as “F1”, “F2” … “F5”, heads of the departments as “H1”, “H2” … “H5”and Vice Chancellors as “VC1” and “VC2” following the idea by Rabaa'i, Bandara, and Gable (2009). The transcriptions of the interviews varied from 10-15 pages for each interview and these were used for the coding of the data, using particular key words related to the relevant research questions.

After coding of the data, different themes were identified by reading the textual data line by line. Eventually different “nodes” were developed to indicate different themes of the study. Each node represented a contextual factor (different themes). A theme is defined as a pattern that minimally describes or organizes possible observations or interprets aspects of the phenomena (Teo, 2017). These themes helped identify and answer the research questions regarding the success of the ERP system.

Employing the thematic analysis approach enabled me to analyze and distill respondents’ views, opinions, knowledge, experiences and values from the categorization and structuring of the interview transcripts. The initial coding process started concurrently with the data collection and during its transcription process. The interview analysis process was guided by the results from the quantitative data that provided some preconceived themes (Saunders et al., 2018). The multilayered process enabled me to iterate back and forth between collected data, theoretical themes and emerged arguments (Maguire, Delahunt, 2017; Glaser, & Strauss, 1967; Suddaby, 2006). Following the suggestions of Braun and Clarke (2006), Maguire and Delahunt (2017) and Pratt et al. (2006), and to ensure quality criteria were met, a three step process was employed to analyze the qualitative data: 1) categorization by converting raw data into empirical themes, 2) developing conceptual categories out of emerged empirical themes, this

enabled me to categorize and code the emerged themes and their relationship 3) Consolidating all the codes into buckets to form a meaning making structure and triangulate this with the quantitative findings.

3.3.7.3 Data Triangulation

This analysis approach of comparing data between different components of the research helped me with the triangulation of the data (Creswell, 2009). Triangulation in research analysis helps the researcher to directly compare, contrast and validate quantitative empirical results with qualitative findings. I have selected the convergence model of a mixed methods triangulation Design as shown in figure 11 (Creswell, 2009). I have collected and analyzed the quantitative data separately for the research sub-questions one, two and three and qualitative data for sub-questions four and five. In the next phase the results were converged to compare, contrast and validate the results during the interpretation.

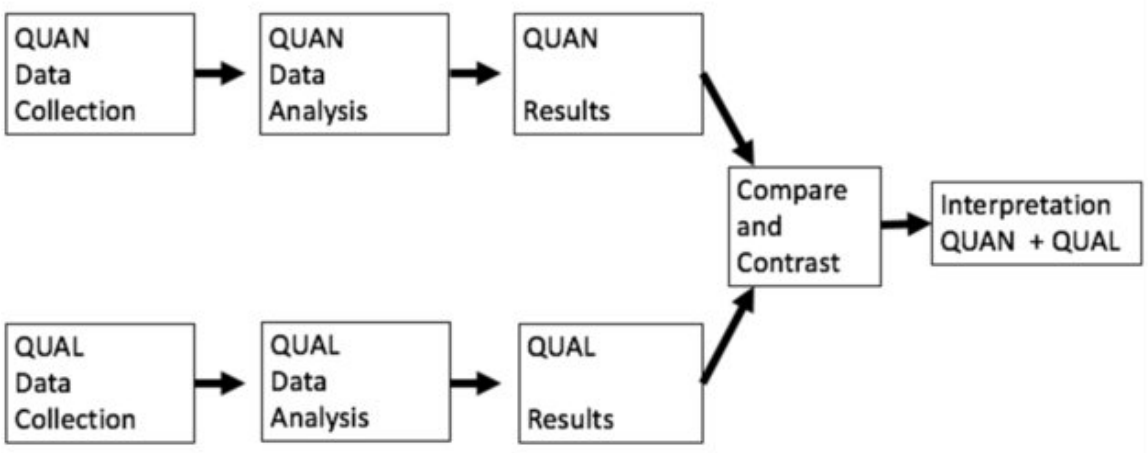


Figure 11: The Convergent Model of Triangulation Design

3.3.8. Ethical Considerations

The ethical standards in research are a predefined code of conduct that provide step by step guidance to the researcher about ethical norms to be followed during the conduct of a research study (Abugabah, 2010). As this research is concerned with HEIs; the researcher followed three steps of approval before the start of collection of empirical data. The first step was receiving authorization from the universities where data was to be

collected. The researcher approached ethical review boards of both the universities through the office of ORIC (Office of Research, Innovation and Commercialization) (see Appendix-E). In the second step, permission was obtained from the head of the University to seek permission to contact the participants for the collection of data. Ethical approval permission was obtained from the heads of the universities. The third step was to get ethical approval from The Virtual Programme Research Ethics Committee (VPREC) from the University of Liverpool. After reviews and changes, I received expedited Ethical Approval from UoL, UK (see Appendix-F). The Standard University of Liverpool Participant Information Sheet (PIS) has been shared with all participants to ensure participants were informed about the study and would be able to give informed consent. The access to the PIS was given to each participant with an explanation of the research and written assurance that data collected would only be used for the particular study for which permission had been received and that nowhere the identity of participant or group would be disclosed. The participants were ensured that no data misinterpretation or distortion would take place in reporting research results. This procedure ensured integrity by adherence to all standard norms and procedures for research (Ndung'u & Kyalo, 2015).

Participation in the research was voluntary and all the personal names and university names have been removed to ensure confidentiality. Participants' interests have been safeguarded, and no identity was disclosed during the analysis of data and discussion of the research findings to ensure anonymity. The collected data has been stored on my password protected personal computer without access to any unauthorized users. The backup data has been stored on an external hard-drive in my personal custody at a secure place and is password protected. All the recordings of the interviews after interpretation of the data have been stored securely in a locked cabinet to which only I have access (Ndung'u & Kyalo, 2015). During the interview process, I tried to keep the participants relaxed and comfortable (Oliver, 2003, pg. 45). All interviews were recorded and the purpose of the recording of the interviews was shared with participants. Each participant permitted me to audio-record the interview. The interviews were conducted at the University campus in a private pre-reserved meeting room to avoid any disturbance and preserve anonymity. The interviews at a distance were conducted through Skype

sessions in the same room. The procedure of deleting the recording after all the data had been transcribed from these devices was explained to participants (Oliver, 2003). The data stored on the computer hard-drive would be physically destroyed after five years.

I ensured the confidentiality and anonymity of the participants during the collection and analysis of data and honest reporting of the research findings. The researcher ensured to the participants that integrity would be maintained in handling the collected data. The participants were also free to pass on any question, which they thought they did not want to answer (Oliver, 2003). I worked to ensure that my selection of participants was fair and that the selection process was without bias to gender, age, class, or educational status. An interview protocol set the interview process standards, which consisted of an introduction, research overview, flexible questions, and participant's rights (DuBois et al., 2012). Random identities were used to ensure the privacy of the participants and participating universities. Participants were given access to check the accuracy of the information they had given and a copy of the filled questionnaire for their satisfaction, if they requested that. The participants in the research study were ensured that they could withdraw from the research at any time.

Before the data collection commencement, I received ethical approval from two participating universities' research ethics boards and from the Virtual Programme Research Ethics Committee (VPREC) from the University of Liverpool, UK. The role of the researcher as practitioner was clarified with participants in the research study.

During the collection of data I was aware about my role as insider in one of the participating university (Dwyer & Buckle, 2009). This was no constraint; on the contrary, this relationship of trust with participants helped me to fully disclose their experiences as compared to less contextual knowledge of an outside researcher (Cohen et al., 2011). The researcher did not have any direct or indirect influence on the participants of the research (Feldman et al., 2003). I am associated in an administration position in one of participating university. I have not taught any course(s) for the past four years and I don't have a student-teacher classroom relationship with participants. I don't have any control on student grades or attendance. For faculty participants, I don't have any direct control on their academic activities or performance review. Faculty members remained my colleagues but I don't have any line manager role in their academic matters. As far as

interviews are concerned I have selected senior faculty members as participants who are or remained Heads of departments, Dean's are in some leadership position.

The anonymity of participants was guaranteed through the Participant Information Sheet (PIS). The research objectives and volunteer participation with participants in PIS was clearly shared. All the participants completed and signed the consent form, and they were informed that they could withdraw from participation without any venality from the process (Arthur, 2016).

The researcher ensured the confidentiality and anonymity of the participants during the collection and analysis of data and honest reporting of the research findings. The researcher ensured to the participants that integrity would be maintained in handling the collected data. The participants were also free to pass on any question, which they thought they did not want to answer (Oliver, 2003). I worked to ensure that my selection of participants was fair and that the selection process was without bias to gender, age, class, or educational status. An interview protocol set the interview process standards, which consisted of an introduction, research overview, flexible questions, and participant's rights (DuBois et al., 2012).

3.4 Conclusion

This chapter has discussed and explained the methodological part of the study in detail. The chapter begins by discussing the theoretical model of the quantitative part of the research study and highlighted why an adaptation of the DeLone and McLean (2003) model is the most useful to study the impact of ERP in higher education institutions; in particular for academic and decision-making processes. Hypotheses were developed for empirical testing of the research model in the ERP system environment while considering the main research paradigm and methodology used in the research study, explaining and justifying the selection of a mixed method approach. A mixed method approach has been selected and found appropriate to the research context and convergent triangulation design type used. The use of data collection tools from the quantitative and qualitative strands were explained, including the use of a questionnaire and semi-structured interviews.

The quantitative data was collected through online questionnaires, based on valid items of each variable of the current research study. The qualitative data has been collected through semi-structured interviews conducted face to face and through Skype sessions. This chapter discussed in detail the sample size for quantitative and qualitative techniques and the pilot study to validate the questionnaire and measurement scale used in the survey. The chapter also discussed ethical approval from various participants.

The next chapter will discuss the quantitative and quantitative data analysis and findings based on the current study. The triangulation and mixing of both data will also be further discussed in the chapter 6-findings and discussions.

Chapter 4- Findings

4.1 Introduction

This chapter focuses on the empirical findings of the research study that combines both quantitative and qualitative research methods. As explained in the previous chapter, the research study used an explanatory sequential research design of a mixed method approach. The first part of this chapter covers the quantitative measures of the study whereas the second part of this chapter deals with the qualitative analysis. The empirical outcomes gathered from quantitative and qualitative data analysis are discussed separately in this chapter, after which a summary of the combined results follows.

4.2 Quantitative Data Analysis

After the completion of the data collection stage, the data processing was undertaken. For the quantitative data analysis many statistical Software are available, I have selected the Statistical Package for Social Sciences (SPSS) to perform statistical analysis. SPSS is a statistical software package developed by IBM Corporation and widely used by the researchers and academicians worldwide. SPSS Software was used to first clean the data by handling missing values, outlier assessment, normality assessment, multicollinearity assessment, common method variance assessment and descriptive analysis.

Next, the present study employed Partial Least Square –Structure Equation Modeling (PLS-SEM) techniques using the SmartPLS 3.2.8 (Ringle et al., 2015) Software package to conduct validity and reliability tests and to generate path coefficients. SmartPLS is a statistical package primarily designed by the team of developers from the academia in Germany (Ringle et al., 2013; Hair et al., 2014). The selection of these tools for quantitative data analysis was based on the research objectives ad research questions. PLS-SEM used for empirically testing conceptual model (Ong & Puteeh, 2017).

4.2.1 Statistical Data Preparation

The researcher ensured that data was clean and ready before processing with the analysis. Data was prepared to avoid mistakes participants had encountered while filling

the questionnaires. Hence, the researcher performed different tests to examine the missing data, normality, outlier assessment and Common Method Variance (CMV) of the data (Kwak & Kim, 2017).

4.2.1.1 Missing Values Assessment

Missing values analysis is very helpful in addressing issues instigated by missing data. Missing values and outliers are frequently encountered while collecting data through a questionnaire. The existence of missing values in the data set reduces the size of the sample to be analyzed (Kwak & Kim, 2017). A reduced sample size would compromise the statistical power of the study and ultimately the reliability and validity of the results. In addition, it causes a visible bias in the results, which lowers the efficiency of data (Jia, 2016).

Missing data may have serious consequences, because it lowers the accuracy of computed statistics as there is less data than initially intended. These issues become serious when the extant of missing values is above 5% and/or those values are missing in a non-random fashion (Kwak & Kim, 2017). However, in the current study's SPSS data set, 7,360 values of observed variables were entered and no missing value was found in all latent variables such as information quality, service quality, system quality, user satisfaction, and net benefit. This happened as the data were collected through a self-administration process and I as researcher carefully evaluated each response after the respondents completed it.

4.2.1.2 Outlier Assessment

According to Barnett and Lewis (1994), outliers are "observations or subsets of observations which appear to be inconsistent with the remainder of the data" (p.7). In statistical data analysis, an outlier in a data set may alter the value of coefficients in regression estimates and generate biased results (Verardi & Croux, 2008). Outliers significantly affect the process of estimating statistics such as average, standard deviation of chosen sample, which results in overestimating or underestimating values. The results of data analysis are significantly dependent upon how the missing values and outliers are being processed. The term 'outlier' refers to extreme values that lie abnormally outside the overall pattern of distribution of variables. Outliers can result from a number of

factors, including participant response errors and data entry errors. Dealing with outliers is important prior to the analysis of the data set containing possible outliers. The outliers are modified by identification of their sources or by replacing them with substituted values (Kwak & Kim, 2017).

In order to recognize any observation, which seems to be outside the SPSS labeled values because of incorrect data entry, first of all, recurrence tables were computed for all variables utilizing least and most extreme measurements. In view of this preliminary analysis, I could not find any value seen as outside the anticipated range. In addition to this frequency analysis, Mahalanobis distance was used to detect the multivariate outliers. According to Tabachnick and Fidell (2007) Mahalanobis distance is "the distance of a case from the centroid of the remaining cases where the centroid is the point created at the intersection of the means of all the variables" (p.74). In light of the 32 observed variables of the investigation, the prescribed limit was $\chi^2 = 62.03$, $p = .001$. Mahalanobis values that surpassed this limit were erased. Following this measure, 10 multivariate outliers were identified and eventually erased from the dataset on the grounds that they could influence the precision of the data analysis method. Accordingly, subsequent to deleting 10 multivariate outliers, the final dataset in this study contained 230 data points.

4.2.1.3 Normality Assessment

Previously, it was assumed that accurate model estimations were performed by using the PLS-SEM method even in an enormously non-normal situation (Cassel, Hackl, & Westlund, 1999; Reinartz, Haenlein, & Henseler, 2009). Yet, recent methodologists suggest that extremely non-normal data might be a concern in PLS-SEM. According to Hair, Sarstedt, Ringle and Mena (2012), a normality test should be performed due to the fact that skewed or kurtotic data may expand bootstrapped normal error estimations (Chernick, 2008). As a result, it would estimate wrongly the statistical significance of the path coefficients (Ringle, Sarstedt, & Straub, 2012). Thus, in order to examine normality of collected data, this study adopted the graphical method that was suggested by Tabachnick and Fidell (2007).

An assessment of the normality of the data is prerequisite for many statistical tests. According to Field (2009), for a sample of 200 or more, it is imperative to see the shape of the distribution graphically instead of checking the statistical value of skewness and kurtosis because in the case of a large sample, standard errors would be decreased, which would lead to boosting the value of the skewness and kurtosis statistics. Newton and Rudestam (2013) defined the term *skew* to describe the distribution that deviate from a perfectly symmetrical shape. Therefore, this study used histogram and normal probability plots to check normality of data set.

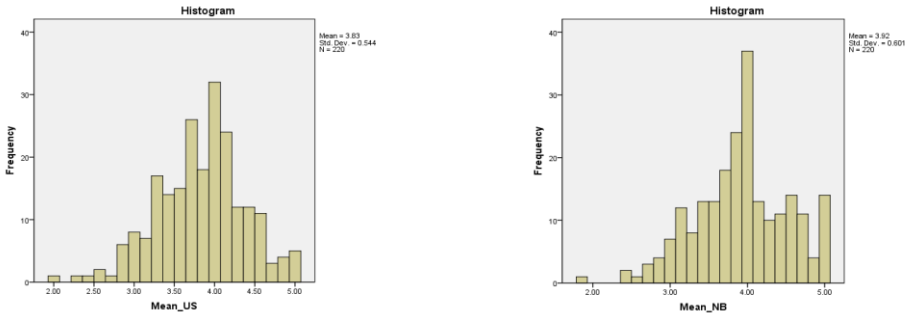


Figure 12: Histogram and Normal Probability Plots

The bell-shaped histogram graph ideally shows normal distribution, which means data are positively skewed and distributed with more numbers centralized in the middle of the range and remaining dispersed symmetrically on both sides. Figure 12 above shows the histogram and normal probability plots. Overall, it illustrates that the data distribution of two variables (User Satisfaction and Perceived Net Benefits) follow the normal pattern. This implies that the mean is closer to the left side. Siegel (2016) defined that all data sets would not be normally distributed in real life. Moreover, according to Stephen (2009), data collected by using the Likert scale cannot be normally distributed, because a Likert scale can never generate normally distributed data. Likert scales are mostly ordinal not interval, therefore it is quite difficult to validate any statistics that are intended for interval data. Therefore, this study complies with the assumptions of normality.

4.2.1.4 Common Method Variance (CMV) Test

Sometimes the data set collected through a questionnaire is based on the same respondent replies. This may be problematic since the same respondent studies can suffer from common method variance. This concern will be the strongest when dependent and focal explanatory variables are perceptual measures derived from the same respondent and are collected at the same time. CMV creates false internal consistency, which is an apparent correlation among variables generated by their common source (Chang, Witteloostuijn, & Eden, 2010).

However, in order to reduce the impact of CMV, I used some practical remedies. To begin with, to diminish assessment anxiety, I informed the participants that there is no right or wrong answer to the items in the questionnaire and to be certain that their response would be confidential during the course of this study. Secondly, to additionally improve the items of each variable, all questions in the questionnaire were written in a basic, explicit, clear and succinct language. In addition to the procedural measures mentioned above, this study adopted Harman's single factor test used by Podsakoff and Organ (1986) in order to investigate common method variance. As per the single factor test proposed by Harman's (1967), when a single factor may appear, or one general factor would explain most of the covariance in the predictor and criterion variables, it shows that a common method variance exists (Podsakoff & Organ, 1986). Succeeding Podsakoff and Organ (1986), principal components analysis was used to determine the factors of the study. The result of this analysis shows that the cumulative variance is 62.144% and the first factor (being largest) accounts for 34.245% of the total variance. This is less than the threshold of 50% (Kumar, 2012), which shows that no single factor explains the majority of covariance in the dependent and independent variables. Therefore, it seems that there is not an issue of common method bias in this study.

Data cleaning is an essential step in any research to ensure that the produced data is usable, valid and reliable for the testing of the research framework (Awang, Aji, & Osman, 2018; Won, Wan, & Sharif, 2017). During the data cleaning procedure some issues have been considered such as missing data, outliers and normality assessment, as the tests used suggested these not to be valid for this study. In addition, this study also examined the Common Method Variance (CMV) test. The results above show that all the

assumptions for multivariate analysis have been met. This proves that the data set is robust and ready for further multivariate analysis requirements (Awang, Aji, & Osman, 2018; Hussaini, Bakar, Yusuf, 2018). All these tests were performed using the SPSS Statistical Package.

4.2.1.5 Response Rate and Descriptive Analysis

Students and faculty members from two universities were invited to participate in this research. The selected universities have successfully implemented an ERP system. The ERP system is successfully running in the selected universities. The target population included those individuals who were actively using the ERP system such as students, faculty members and Heads of academic departments. 500 questionnaires were sent by email to participants in different academic departments of the two selected universities. Out of those only 373 filled out the questionnaire and sent it back. 141 faculty members and 232 students filled out the online questionnaires. The response rate was about 74.6%. After clean-up of the data, a total of 230 forms were 100% completely filled out, which included 120 student surveys and 110 surveys by faculty members. The sample method used was the convenience sampling technique while selecting the ERP participants of both the universities (Etikan, Musa, & Alkassim, 2016). The design of the questionnaire was developed and adopted based on various items and ERP measures that were collected and adopted from various sources (Shatat, 2019).

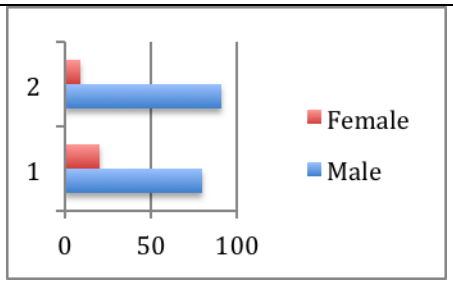
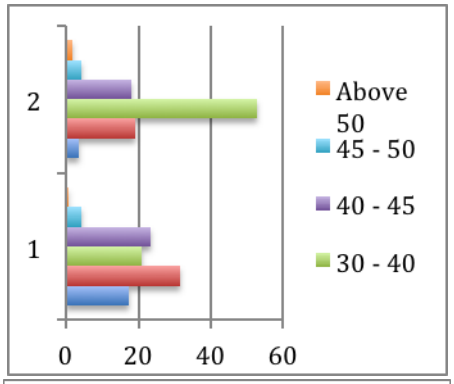
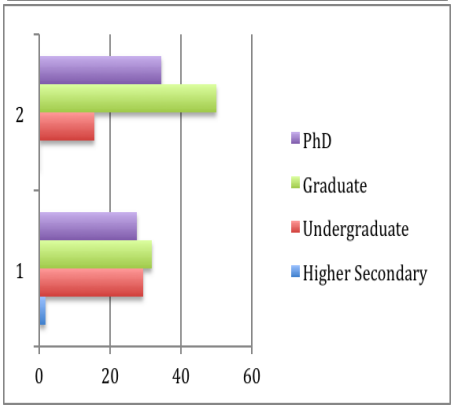
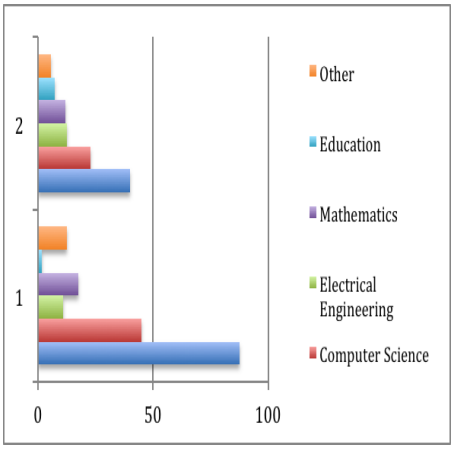
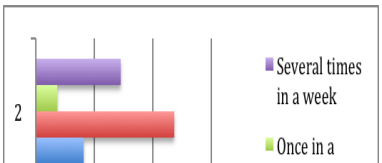
120 students filled the forms representing 52% of the total sample size. About 31.7% users are using the ERP system several times a day and 26.7% several times in a week. Analysis of ages of participants showed that 70% participants were under the age of 30 and 30% above the age of 30 years. The highest number of the student population participating in filling out the questionnaire were quite young and fall in the age bracket of 21-30 years. The analysis of educational background showed that 60.9% were studying in bachelor's degree programs and 39.1% in postgraduate degree programs.

110 faculty members filled the forms correctly representing 48% of the total sample size. About 47.3% users are using the ERP system several times a day and 29.1% several times in a week. Analysis of ages of participants showed that 75.5% participants

were under the age of 40 and 24.5% above age of 40 years. The highest number of the faculty population participating in filling out the questionnaire fell in the age bracket of 25-45 years. The analysis of educational qualification showed that 34.5% were PhD degree holders, 50.0% had Masters or M.Phil degree and 15.5% having a Bachelor's degree.

As discussed in section 3.3.5 of chapter-03 the two types of surveys were designed separately, keeping in mind the different usage of ERP by students and faculty members. The number of questions in both surveys was the same. In a few questions the language was changed keeping in mind the use of the ERP system by the particular user (see Appendix-A and Appendix-B). The more general questions (sub-questions one and two of the research study related to the improvement of academic processes) of the research study will be explored in the quantitative part of this chapter. The qualitative part will explore the third and fourth research question related to improvement in teaching methodology after getting feedback on course evaluations and improvements in the higher education leadership decision-making process after implementation of ERP systems. After the descriptive analysis of the demographic data and responses to the questionnaire, it was decided to merge the demographic data and survey questionnaires responses in a single file to check the reliability and robustness of the proposed research model. (Details of descriptive and questionnaires response analysis are given in Appendix-G).

Table 2
Demographic Profile of Respondents

Variables	Categories	Frequency	Percent (%) Students	Percent (%) Faculty	
Gender	Male	196	80%	90.9%	
	Female	34	20%	9.1%	
Age	21 – 25	25	17.5%	3.6%	
	25 – 30	59	31.7%	19.1%	
	30 – 40	83	20.8%	52.7z%	
	40 – 45	48	23.3%	18.2%	
	45 – 50	10	4.2%	4.5%	
	Above 50	5	0.8%	1.8%	
Education	Higher Secondary (12 years)	35	1.7%	0%	
	Undergraduate (16 years)	55	29.2%	15.5%	
	Graduate MS/MPhil (18 years)	88	31.7%	50%	
	PhD	52	27.5%	34.5%	
Department	Business Administration	98	87.5%	40%	
	Computer Science	38	45%	22.7%	
	Electrical Engineering	35	10.8%	12.7%	
	Mathematics	15	17.5%	11.8%	
	Education	23	1.7%	7.3%	
	Other	21	12.5%	5.5%	
Use of ERP	Once a day	37	12.5%	16.4%	

System	Several times a day	90	15.8%	47.3%
	Once in a week	39	31.7%	7.3%
	Several times in a week	64	25.8%	29.1%

4.2.1.6 Descriptive Analysis-Student Responses to Questionaries'

The details of the descriptive data of participant responses are given in appendix-G. Figure 13 reflects the descriptive data of respondent responses on different questions. The mean of each question response is greater than (>3) which shows that the frequency of answers is in the range of agree and strongly agree, then in disagree and strongly disagree.

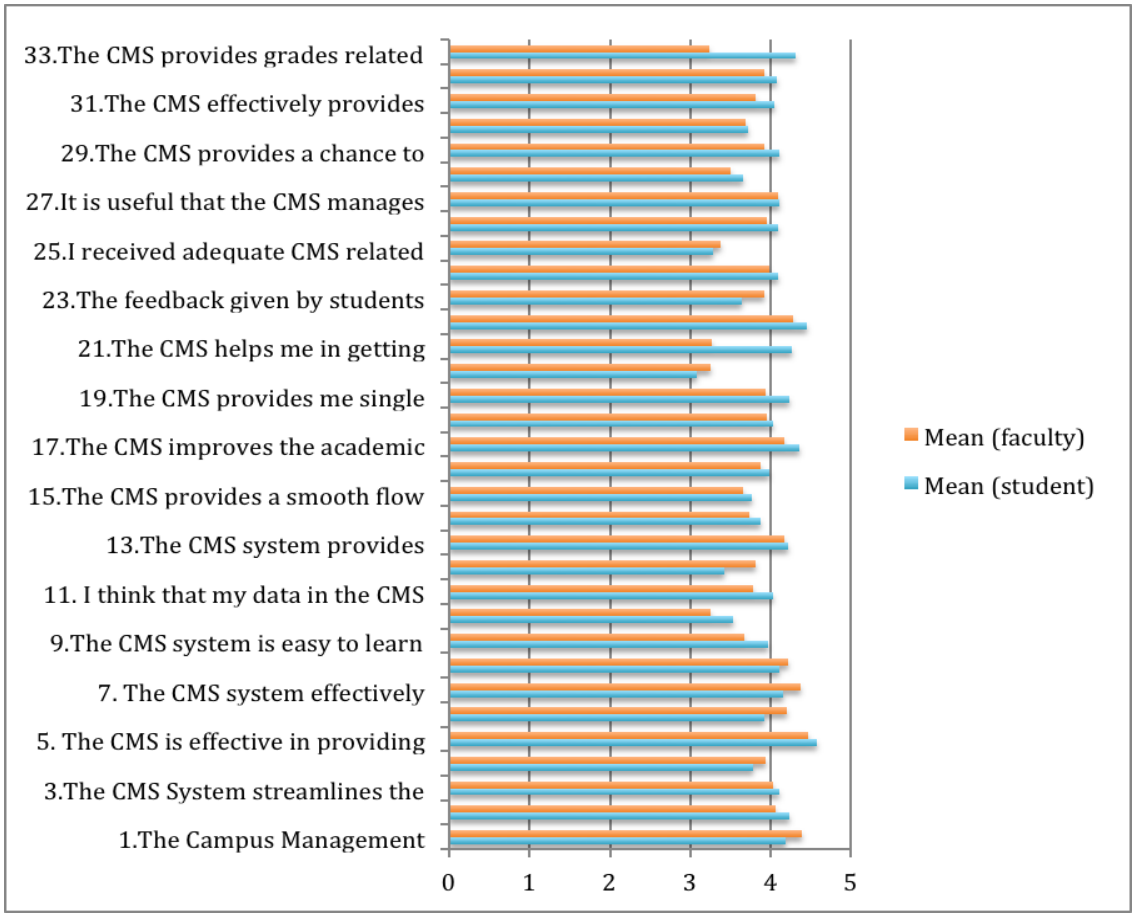


Figure 13: Mean Plots of Questionnaire Responses

*4.2.2 Partial Least Squares Structural Equation Modeling (***PLS-SEM***)*

Structural Equation Modeling (SEM) is a powerful multivariate data analysis tool, which has gained wide popularity in recent decades (Jia, 2016). The present study used a variance-based approach, or partial least square structural equation modeling (PLS-SEM) (Chin, 1998; Henseler, Ringle, & Sinkovics, 2009; Wold, 1974). This choice was made for several reasons. First, this multivariate approach is favored over other traditional methods of analysis such as first generation software like SPSS (Haenlein & Kaplan, 2004; Henseler, Ringle, & Sinkovics, 2009). Second, this method is efficient because it has the ability to simultaneously estimate the hypothesized relationship (Hair et al., 2016; Hair et al., 2013; Henseler et al., 2009). Third, using the bootstrapping procedure, this method produces estimates, which are statistically reliable (Kock, 2014; Hair et al., 2016). Lastly, for the current study I also preferred this method due to its user-friendly environment; this method has the ability to deal with non—normal data, and handle small as well as large sample sizes (Urbach & Ahlemann, 2010). Therefore, in this study I opted for using this method to perform the data analysis.

The present study used PLS-SEM for data analysis and adopted the two-step approach following the suggested trend highlighted by other researchers (Hair et al., 2016; Ringle et al., 2012) under which in the present study I first examined and ascertained a suitable measurement model to test indicator reliability, internal consistency reliability, convergent validity, and discriminant validity. Secondly, I examined a structure model of the study, after the measurement model, to test the hypothetical relationship of the study.

4.2.2.1 Indicator Reliability

The indicator reliability was examined through outer loadings of each construct's measure and a rule of 0.50 was used to retain items, which is widely suggested in the literature as being good results (Duarte & Raposo, 2010; Hair et al., 2016; 2014; 2012; Hulland, 1999). Following the above criterion one item (NB7) was deleted from the Net-Benefits variable; two items were deleted from information quality namely IQ1 and IQ6; similarly, one item was deleted from System quality (SQ1); and four items were removed due to lower loadings from user satisfaction namely US1, US2, US3, and US6. The rest

of the items were retained as those items met the minimum suggested criterion. The details of the items loading are available in Table 3 measurement model assessment.

Table 3
Measurement Model Assessment

Construct	Item	Loadings	Cronbach's Alpha	*CR*	*AVE*
Impact of ERP	U1	0.852	0.807	0.885	0.719
	U2	0.864			
	U3	0.827			
Information Quality	IQ2	0.705	0.740	0.837	0.564
	IQ3	0.795			
	IQ4	0.818			
	IQ5	0.679			
Perceived Net-Benefits	NB1	0.661	0.806	0.861	0.509
	NB2	0.681			
	NB3	0.723			
	NB4	0.773			
	NB5	0.737			
	NB6	0.697			
Service Quality	SrQ1	0.766	0.782	0.859	0.605
	SrQ2	0.774			
	SrQ3	0.838			
	SrQ4	0.728			
System Quality	SQ2	0.745	0.772	0.846	0.524
	SQ3	0.773			
	SQ4	0.698			
	SQ5	0.703			
	SQ6	0.696			
User-Satisfaction	US4	0.754	0.608	0.793	0.561
	US5	0.782			
	US7	0.708			

4.2.2.2 Internal Consistency Reliability

The extent to which all the items of a given (sub) scale measure the same concept is called internal consistency reliability (Bijttebier et al., 2000; Sun et al., 2007). In the organizational research settings, the most widely used estimators of internal consistency

reliability of a scale are Cronbach's alpha and composite reliability coefficients (e.g., Bacon, Sauer, & Young, 1995; McCrae, Kurtz, Yamagata, & Terracciano, 2011; Peterson & Kim, 2013). Table 3 shows the factor loading, cross loading, Cronbach's alpha and values of composite reliability (CR) of each construct of the model. The internal consistency reliability indicates how well items of a given variable measure the same concept (Bijttebier et al., 2000; Sun et al., 2007). Studies in the past have been solely reliant upon Cronbach's alpha coefficient. However, recent studies such as Hair et al. (2017) have suggested a better result if composite reliability coefficients are being achieved as these points out limitations of the Cronbach's alpha coefficient. Hence, the present study reports both of the measures of internal consistency reliability i.e Cronbach's alpha coefficient as well as composite reliability coefficients (Bacon et al., 1995; Peterson & Kim, 2013). Following the rule of thumb for Cronbach's alpha coefficient of 0.60 or above and composite reliability 0.70 or above for all observed variables (Hair et al., 2013; 2016). The results shown in table 3 indicate that all the constructs of this study successfully met these criterions.

4.2.2.3 Convergent Validity

The convergent validity refers to the degree to which items correlate with each other and truly represent the same construct (Hair et al., 2006). In this line of thinking, Fornell and Larcker (1981) suggested that the convergent validity of a construct should be evaluated using Average Variance Extracted (AVE). Chin (1998) suggested that the AVE values for each construct should be 0.50 or above. The results in Table 3 of this study indicate that all the variables of the study demonstrated an AVE score greater than the give threshold of 0.50, which shows existence of convergent validity (Hair et al., 1998) (see Table 3).

4.2.2.4 Discriminant Validity

I next examined discriminant validity; which refers to the concept of how well a given variable is distinct from other variables of the same research model (Duarte & Raposo, 2010). In order to assess discriminant validity the current study followed the method used by Fornell and Larcker, (1981), who suggested that the correlation between the latent variables should be compared with the average variance extracted of a variable.

They further suggested, that the squared root of AVE of a given variable should be greater than its correlations with other variables. Table 4 indicates that the current study has successfully met the discriminant validity criterion as well.

Table 4

Discriminant Validity

Latent variables	*1*	*2*	*3*	*4*	*5*	*6*
Impact of ERP	**0.848**					
Information Quality	0.544	**0.751**				
Perceived Net-Benefits	0.609	0.505	**0.713**			
Service Quality	0.607	0.709	0.641	**0.778**		
System Quality	0.551	0.636	0.648	0.663	**0.724**	
User-Satisfaction	0.373	0.504	0.674	0.495	0.549	**0.749**

4.2.3 Assessment of a Structural Model

After establishing the reliability and validity of the latent variables in the measurement model, I accessed the structural model to test the relationship between endogenous and exogenous variables. In PLS-SEM, the structural model assessment includes the path coefficient to evaluate and test the significance and relevance of the structural model relationships, R^2 value, to evaluate the model's predictive accuracy, Q^2 to evaluate the model's predictive relevance, and f^2 to evaluate the substantial impact of exogenous variable on an endogenous variable (Hair et al., 2013). As stated earlier in this section, the current study followed a two-step approach; I first examined and established the acceptable fit of the model and the next step was to determine the significance of the structural model.

The first step of the structural model assessment was to examine multicollinearity among the variables of the study through examining the Variance Inflation Factor (VIF) values. PLS-Algorithm results suggest that all the VIF values were below 5. Hence, multicollinearity is not a concern in this data set. Therefore, I proceeded with the next step; which was to determine the significance of the path coefficients.

For the above reason, the present study used the PLS-SEM based on a bootstrapping procedure with a subsample of 5000 and one-tailed t-test to test the proposed hypotheses (Hair et al., 2012; 2014; 2016; Henseler et al., 2009). The first hypothesis of the study was to examine the positive relationship between ERP system quality and ERP user satisfaction. As indicated in Table 5 this relationship was empirically supported β = .336, $t(224)$ = 3.889, p < .001. Thus H_1 was supported.

The H_2 of the current study was to examine a possible positive relationship between ERP information quality and ERP user satisfaction; the results indicate that this relationship was also supported β = .194, $t(224)$ = 1.958, p < .05. The H_3, dealt with the possible positive relationship between ERP service quality and ERP user satisfaction and the results are not supported for this hypothesis β = .134, $t(224)$ = 1.580, p < .057. H_4 was meant to find out the possible positive association between ERP user satisfaction and ERP perceived net benefits; and findings indicate an empirical support β = .674; $t(224)$ = 19.019, p < .00. Next, the present study hypothesized that the ERP perceived net benefits would be positively related to the impact of ERP β = .609, $t(224)$ = 14.692, p < .00. Thus, H_5 was also supported.

H_6 indicates a positive association between information quality and the impact of ERP. The results suggest a positive support β = .206, $t(224)$ = 2.598, p < .05. Similarly, for H_7 the results suggest a positive relationship between information quality and perceived net benefits β = -.117, $t(224)$ = 1.82, p < .05. Thus, H_7 also obtained empirical support. Next, H_8 hypothesized the relationship between service quality's positive impacts over ERP. The results also extend to a positive support for this hypothesis β = .211, $t(224)$ = 2.535, p < .00. Next, H_9 hypothesized the relationship between service quality's positive association with perceived net benefits and the results also extend positive support for this hypothesis β = .354, $t(224)$ = 5.772, p < .00. Thus H_9 also obtained support. However, in H_{10} the relationship between the system quality's positive association with the impact of ERP was tested and the results are not supported for this hypothesis β = .098, $t(224)$ = 5.772, p < .119. Contrary to the other findings this relationship could not be supported through empirical support. In H_{11}, the relationship between the system quality's positive association with perceived net benefits was hypothesized β = .264, $t(224)$ = 3.668, p < .00. Thus, H_{11} obtained empirical support.

Lastly, H_{12} was about the positive relationship between user satisfaction and the impact of ERP. My results found $\beta = -.170$, $t(224) = 2.255$, $p < .05$ that empirically supports the hypothesis.

In conclusion, out of the twelve hypotheses drawn up at the start of this study, all hypotheses were supported by the data, except H_3 and H_{10}. The rest of the hypotheses in the present study found empirical support. These results are further presented in Table 5 and Figure 14.

Table 5

Path Model Coefficients

Hypotheses	Relationships	Coefficients (Beta)	Standard Error (SE)	T-value	P – Values	Decision
H_1	System Quality -> User-Satisfaction	0.336	0.086	3.889	0.000	Supported
H_2	Information Quality -> User-Satisfaction	0.194	0.099	1.958	0.025	Supported
H_3	Service Quality -> User-Satisfaction	0.134	0.085	1.580	0.057	Not-Supported
H_4	User-Satisfaction -> Perceived Net-Benefits	0.674	0.035	19.019	0.000	Supported
H_5	Perceived Net-Benefits -> Impact of ERP	0.609	0.041	14.692	0.000	Supported
H_6	Information Quality -> Impact of ERP	0.206	0.079	2.598	0.005	Supported
H_7	Information Quality -> Perceived Net-Benefits	-0.117	0.064	1.82	0.034	Supported
H_8	Service Quality -> Impact of ERP	0.211	0.083	2.535	0.006	Supported
H_9	Service Quality -> Perceived Net-Benefits	0.354	0.062	5.724	0.000	Supported
H_{10}	System Quality -> Impact of ERP	0.098	0.083	1.178	0.119	Not-Supported

H_{11}	System Quality -> Perceived Net-Benefits	0.264	0.072	3.668	0.000	Supported
H_{12}	User-Satisfaction -> Impact of ERP	-0.17	0.075	2.255	0.012	Supported

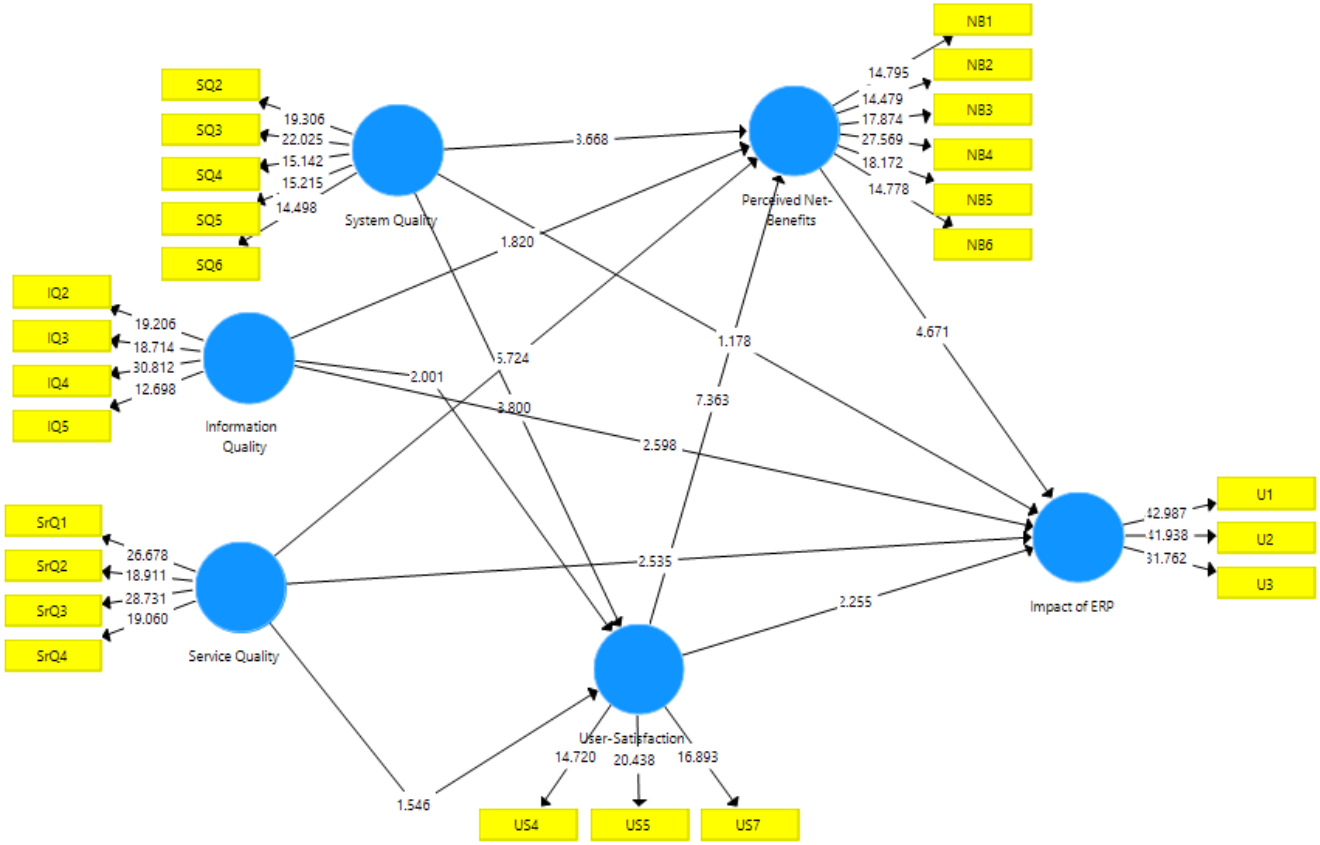


Figure 14: Path Co-Efficient (Structural Model)

4.2.3.1 Assessment of variance explained in the Endogenous variables

In the present study I examined R^2 (Coefficient of determination) values (Hair et al., 2010). The R^2 value represents the proportion of variance in the dependent variables explained by one or more independent variables (Hair et al., 2010; Elliott & Woodward, 2007). How much R^2 value is accepted or desired varies from research context to context

(Hair et al., 2010). However, according to Falk and Miller, (1992) if a given model demonstrates an r-squared value up to 0.10 or above it should be accepted in the social sciences context. Additionally, according to Chin, (1998) r-squared values of >0.67, 0.33< r-squared < 0.67, and <0.33 in PLS-SEM are considered substantial, moderate, and weak respectively. Table 6 presents the R^2 values of the current study, which are accepted, and they also fall in the moderate to substantial categories as per Chin's (1998) criterion. Hence, the current study establishes its robustness by demonstrating such an R^2 values.

Table 6

Assessment of Variance Explained in the Endogenous Latent Variables

Latent Variable	Variance Explained (R^2)
Impact of ERP	48.7%
Perceived Net-Benefits	61.8%
User-Satisfaction	35.0%

4.2.3.2 Assessment of Effect Size (f^2)

The effect size suggests a relative effect of a particular independent variable over dependent variable. This assessment shows how much importance a given independent variable holds compared to the others in affecting a given dependent variable (Chin, 1998). According, to Cohen, (1988) the effect size of a variable is considered small when its value is between 0.02 and 0.15, medium when its value is between 0.15 and 0.35, and large when it demonstrates an effect size value of more than 0.35. Since the effect size assessment indicates how well an independent variable affects a dependent variable in comparison to the other independent variables that are measuring the same dependent variable in a given model, the assessment of the results in this study are as follows:

The dependent variable "Impact of ERP" was predicted by five independent variables (namely information quality, perceived net-benefits, service quality, system quality, and user satisfaction) in the research model of the current study. Hence, the effect size values indicate that the relative effect of perceived net benefits over the impact of ERP variable was noticeably higher than other independent variables, whereas the effect

size of all other independent variables in measuring the impact of ERP was small. It is also important to note that a smaller effect size does not indicate that a given modeled independent variable is not important, but it rather indicates the relative worth of an independent variable in the given model (Hair et al., 2013; 2016).

Similarly, the dependent variable "perceived net benefits" was predicted by independent variables such as information quality, system quality, service quality and user satisfaction. The results indicated that out of the four predicting variables, the relative effect of user-satisfaction over perceived net benefits was higher. This means that the respondent's satisfaction is a prime factor in enhancing the perceived net benefits. Moreover, it was also noticed that the relative effect of service quality over perceived net benefits was higher than information quality and system quality. The third dependent variable in this study was "user satisfaction" that was predicted by information quality, system quality, service quality. However, the f-squared values indicate the relatively system quality is a better predictor of user satisfaction. Such a detailed presentation of effect size scores is provided in Table 7.

Table 7

Effect Size Assessment

	Impact of ERP	Perceived Net-Benefits	User-Satisfaction
Information Quality	0.036	0.016	0.028
Perceived Net-Benefits	0.130	N/A	N/A
Service Quality	0.032	0.137	0.011
System Quality	0.008	0.084	0.084
User-Satisfaction	0.028	0.287	N/A

4.2.3.3 *Assessment of Predictive Relevance (Q^2)*

The present study used the Stone-Geisser test of predictive relevance to test the quality of the fit of the model using the blindfolding procedure (Geisser, 1974; Stone, 1974). This test has been considered as one of the most relevant methods to test predictive relevance (Duarte & Raposo, 2010). PLS-SEM demonstrates this ability to test predictive relevance through the blindfolding procedure. Hence, following upon that criterion, the current study evaluated predictive relevance of the model by looking into

the Q^2 values in the cross-validated redundancy measure. According to several established studies (Chin, 2010; Geisser, 1974; Hair et al., 2013; Ringle, Sarstedt, & Straub, 2012b; Stone, 1974) if the Q^2 value of the dependent variable is greater than zero then the model demonstrates predictive relevance. (see Table 8). It depicts that all the Q^2 values of the dependent variables of the study are greater than zero. Hence, I concluded that this study demonstrates predictive relevance.

Table 8

Construct Cross-Validated Redundancy

Endogenous variables	SSO*	SSE**	Q^2 (=1-SSE/SSO)
Impact of ERP	690.00	471.893	0.316
Perceived Net-Benefits	1,380.00	988.171	0.284
User-Satisfaction	690.00	571.927	0.171

*Squared Sum of Observation (SSO); **Sum of Squared prediction Errors (SSE)

In the quantitative study, I as researcher examined the updated research framework based on the DeLone and McLean (2003) IS success models in the context of the impact of ERP systems in higher education institutions and how it supports the improvement of academic processes. The results are shown in Figure 12 and Table 5. The results indicated that, based on the empirical results, the ERP users perceived that the ERP provides quality information. The results further suggested that the participants were satisfied with using the ERP.

Moreover, the results suggest that ERP users were also satisfied with the service quality, while they also perceived there to be a positive association between the ERP user satisfaction and the ERP perceived net benefits. This implies that the higher the satisfaction is, the higher the perceived net benefit is. Also, the ERP users were found to be satisfied with the ERP perceived benefits. Therefore, they believed that the ERP system benefits their work. This will be further explained in Chapter 5.

The present study also hypothesized (refer to H_5) that ERP perceived net benefits would be positively related to the impact of ERP. Empirical support was also found for this. Because the findings of this study for H5 indicate support, it can be concluded that when the perceptions of the net benefits for ERP will be high, the perceived impact of ERP will also be higher. Hence, this would help employees (ERP users) to exert more energy and utilize this system more in a systematic manner, which is evident from the findings of this study. In H_6, I stated the information quality will be positively associated with the impact of ERP and results found support. This means that when ERP users perceive that the quality of information they obtain from ERP is high, they start believing in the system and see it as being impactful.

In H_7, it was assumed that information quality and perceived net benefits will be positively related. It can be drawn from the empirical support for this hypothesis that since the users of ERP perceive net benefits, that ERP provides high-quality information; therefore, they see the use of ERP as beneficial.

In H_8, in which the relationship between service quality and impact of ERP were hypothesized; the results were supported; which denotes that when perceived service quality, its impact of ERP will be high; the same is the case for service quality and perceived net benefits relationship (H_9). Similar to the above hypothetical relationships, the present study proposed that the perception of system quality would be positively related to the impact of ERP. However, the results could not find support. This indicates that ERP users do not see "system quality" as an important factor contributing to the impact of ERP. However, system quality's relationship with perceived net benefits (H_{11}) was empirically supported, which suggests that this variable contributes to forming the perception towards perceived net benefits that the users could have and/or are having from ERP.

Last but not least, it was hypothesized that the higher the user satisfaction, the higher the perceived impact of ERP (H_{12}); this hypothesized claim found empirical support in the present study, suggesting that user satisfaction is an important factor for ERP impact. Hence, what creates or enhances user satisfaction should be a matter of concern and priority for the policy/decision-makers.

The results of the research study show that all independent variables (ERP System Quality, ERP information quality and ERP service quality) have positive influence on dependent variables user satisfaction, Perceived Net Benefits and Impact of ERP. The overall study results found that positive perception of ERP's are positively associated with higher level of user satisfaction, higher perceived Net-benefits and higher impact. The next section will present the findings of the second, qualitative phase of the data collection.

4.3 Qualitative Data Analysis

Braun and Clarke (2006) stated that thematic analysis provides a flexible and useful research tool, which provides also a rich and detailed, yet complex account of the data. In carrying out thematic analysis I defined several terms used frequently throughout qualitative analysis. The *Data set* refers to all the data collected from semi-structured interviews. The term *Data items* is used to refer to each individual piece of data collected, which together make up the data set. Codes are defined as single ideas associated with a segment of data (Braun, & Clarke, 2006). These are called descriptive codes or often called 'initial codes'. The next analytical step is themes, which is an attribute, element, idea or concept that captures and summarizes the core point of coherent and meaningful pattern in the data. Themes might be renamed to create 'domain summaries' or *buckets* to keep many codes of broad area. Each theme may have sub-themes to obtain a comprehensive view of data.

Vaismoradi et al. (2016*)* describes that a Category refers to the descriptive level primary product of analytical process, has a descriptive identity and is used mainly as beginning of the theme development process to classify findings. Coding is the process of data reduction and is an element of data organization in most qualitative approaches. Conceptual Code, it identifies key elements, domains and dimensions of the study phenomenon (Vaismoradi, Joneees, Turunen, & Sneelgrove, 2016).

Following the suggestions of Braun and Clarke (2006), Maguire, Delahunt (2017) and Pratt *et al.,* (2006), and to ensure quality criteria were met, a three step process was employed to analyze the qualitative data: 1) categorization by converting raw data into empirical themes, 2) developing conceptual categories out of emerged empirical

themes, this enabled me to categorize and code the emerged themes and their relationship 3) Consolidating all the codes into buckets to form a meaning making structure and triangulate this with the quantitative findings.

4.3.1. Move Raw Data into Empirical Themes

This step aimed to first order the coding obtained through emerging empirical themes. The emerged empirical themes were compared within and across transcripts with the objective of obtaining refined empirical boundaries of every theme. Upon obtaining a reliable set of themes, all transcripts were re-read to ensure their fit with the emerged themes. Modifications were made in cases where any of the transcript statements was not a good fit with the themes.

4.3.2 Developing Conceptual Categories

Conceptual categories were developed from initial empirical themes. New coding was carried out to identify relationships among the open codes and empirical themes. The coding process was used to establish conceptual connections between several open codes (Peng & Annansingh, 2013). This step followed the process of relating each theme and category, by employing both inductive and deductive reasoning. Doing so enabled me to merge empirical themes into conceptual categories. This process compared all interviewee data with one another and with emerging conceptual categories. These conceptual categories and their dimensions were used to extract discussion/explanation around discourses of ERP. Auto Code themes are used to quickly identify the broad themes to answer the research questions. A framework matrix summarize the analyze qualitative in table of rows and columns. Typically, individual cases are sorted by row, while themes to which the data have been coded occupy the columns of the matrix

Table 9

Data Structure

First order: (Empirical themes)	Second order codes: Theoretical Categories	Third Order: Theoretical Dimension

• Encouraging in teaching learning process. • Students' opinion about teachers performance and their teaching methodology • Tool for teachers' performance evaluation • Positive impact for both teachers and students performance • Resistance to change from teacher-centered to student-centered approach. • Very helpful in assessing self-teaching pedagogy. • Enables changes in adopted pedagogy and teaching methodology • Opportunity to tailor teaching performance • It connects students with teachers and enhances coordination. • It alerts teachers on their short-comings • Teacher-students communication through LMS is not effective • It also improves teaching methodology evaluation • It has impact on teachers teaching methodology • Good quality and critical feed-back enable teacher to change style and methodology. • It enables teachers to learn and adopt enhanced classroom methodology. • It gives clear picture about teachers' performance. • It is a good tool for teachers' performance evaluation • ERP helps in effective/authentic management decision by observing each activity of student and teacher	*To support faculty in Teaching Methodology and Academic processes*	Teachers' Performance
• Aid to students in improving their weak areas • Positive impact for both teachers and students performance • Effective communication to students about their performance and academic	*Improvement in teaching methodology and better communication*	Students' Performance

progress • Students' opinion about teachers performance and their teaching methodology • Resistance to change from teacher-centered to student-centered approach. • It enables instant student feed back • It connects students with teachers and enhances coordination. • It provides students' reflection • It creates basis for manipulation in students' responses • It provides biased students comments • Students comments should be taken positively for improvements • Being direct stakeholder of the ERP implementation students should be heard and trained. • Teacher-students communication through LMS is not effective • Emergence of CMS and LMS has brought weightage to student course evaluation • Students feedback is not used directly • There should be function for students chatting and continuous feed back • It is bit complicated in communicating results to students. • Students can see results conveniently with improved communication. • It provides identical students responses. • Effective in communication to students about their performance and academic progress • ERP helps in effective/authentic management decision by observing each activity of student and teacher		
• Positive impact of course management. • Emergence of CMS and LMS has brought weightage to student course evaluation • It provides more formalize feed-back for reviewing course contents and their delivery	*Formalized feedback on course contents, classroom delivery and courses assessment*	Courses Management

• Effective in communication to students about their performance and academic progress • ERP helps in effective/authentic management decision by observing each activity of student and teacher • Effective communication to students about their performance and academic progress • Students' opinion about teachers performance and their teaching methodology • Opportunity to tailor teaching performance	*Improved Communication and feedback by students*	Better Communication
• Effective communication to students about their performance and academic progress • LMS process add value into academic process • Continuous training on LMS enables value addition into existing academic process. • It has improved the overall academic process • The implementation brings more rigor to academic and administrative process. • It improves academic process	*Improved support in existing academic processes*	Academic Process and Performance
• Enables changes in adopted pedagogy and teaching methodology • It also improves teaching methodology evaluation • Enables changes in adopted pedagogy and teaching methodology • • It also improves teaching methodology evaluation	*Visible Shift in Classroom Teaching Pedagogy*	Teaching Methodology
• Opportunity to collect faculty feedback on their adopted methodology. • It enables instant student feed back • Feedback mechanism with lateral coordination	*Critical Feedback for Improvement*	Feedback Mechanism

• Enables development of new and effective feed-back forms • It is source of direct feedback. • It is effective in gather real feed back • Students' feedback is not used directly • There should be function for students chatting and continuous feed back • It provides more formalize feed-back for reviewing course contents and their delivery • Good quality and critical feed-back enable teacher to change style and methodology.		
• Current ERP is not user friendly • Interface of LMS and CMS should be more users friendly. • It is systematic and user friendly • User interface should be more user friendly	*Poor user Interfaces and not user friendly*	ERP GUI Interfaces
• It is aligned with vision and mission of the University. • It enables management and HODs to do effective course management. • It provides effective and constructive feedback mechanism. • It facilitates with sound data for planning and decision-making.	*Business Intelligence (BI) reports for strategic Planning and decision making*	Strategic Planning and Decision-Making.

4.3.3 Findings for Qualitative Data

In my literature review I have discussed some studies that used qualitative data analysis. These established that effective use of ERP enables teachers to adopt and execute contemporary teaching methodology in their academic process (Gerogiannis & Fitsilis, 2006). Cutting process time and negative entropies of the system fosters time for other processes, such as a robust teaching and learning process. Charland et al., (2015) suggest that ERP introduction creates a holistic picture of teachers' competencies. Shatat, (2019) stated that there is a relationship between the CMS and LMS on academic performance. For students, it provides them with an explanation of what teaching

methodology a teacher is intended to use. Abugabah & Sanzogni, (2010) mentioned that universities differ from other organizations because they have different environments with different processes and circumstances and use ERP for the improvement of academic processes, which is not a component in other businesses. Many universities implemented the ERP system and shifted their core processes from the old standard system to a new integrated ERP system to improve academic and administrative issues. The qualitative component of my research deals with this and the following sections will each show the findings of a particular theme.

4.3.3.1 Teachers' Performance

As major component of my research questions, it was of interest to me in what ways ERP, particularly the CMS and LMS, impacted teacher's performance. Most of the respondents suggested that they improved their performance through data link and systems coordination among the CMS, LMS, and teachers and course evaluation process undertaken by the Quality Enhancement Cell (QEC). For example, one of the faculty member respondents highlighted issues related to the evaluation form:

> *"I am generally of the thought that **student's feedback telling my real performance** in class there are not much variations, but there are some areas on which I give my feedback to the QEC to change the **content of the evaluation**, for example, there were some questions on whether the overall class environment, especially physical environment was okay or not, and that was coming in the faculty evaluation, so it was discussed with QEC that this should be changed from faculty evaluation form, and they agreed and changed the evaluation from,*
>
> *The second thing was actually, we asked them rather than just asking a single **question on teaching pedagogy**, …; we completely changed the evaluation form because of the **teaching pedagogy** in mostly **case based teaching**. QEC agreed and we have changed the overall form for the evaluation fit, which was more suitable for evaluating the case based teaching, rather than the lecture base, …., so I mean to say whenever we feel some issues one asks the authorities or QEC (F-2)" .*

Faculty members influenced the evaluation process. However, respondents urged for the need of proper training and awareness sessions for the applications and utility of the whole ERP system and its coordinated components. One of the faculty member participants responded to this aspect while sharing his experience:

> *"I guess management very much understands that only bringing software[ERP] is not enough, we need* ***back head office of technical person [support staff]****, as well as we need* ***training of the user*** *of the software [ERP], so,* ***I got the training*** *of each and every Software that is used the University, not once but most of the time we also get those trainings again just to know what updates have been made in these software applications, so* ***training from my personal experience is very good****,* ***we get a lot of support****, and there are people if we need any help we call them or email them*
>
> *Then* ***management already plans for training****, or if any one misses that, one training I missed and then separately planned training for me or some session for me. And then I attended that session (F-2)".*

Consistent with the extant literature and previous studies, the responses from participants showed that the ERP system, when fully adopted and implemented enhanced the operational efficiencies of faculty members. It enables teachers to save time from those activities that can be taken care of by the ERP system and its coordination with impartiality. Drawing upon that benefit, the visualized data enhances teacher's knowledge as compared to manual system previously used.

The majority of the faculty respondents said that the CMS and LMS supported their classroom teaching process. The CMS and LMS helped them manage the assigned courses in a semester effectively. Student attendance and semester results were managed effectively as compared to old manual system.

4.3.3.2 Students' Performance

Noaman and Ahmed (2015) mentioned that successful ERP implementations have a positive effect on the student performance. As explained in the last section on ERP effectiveness for teachers' performance, most of the faculty responses around advocacy indicated that the ERP system data collection improves their teaching methodology and fosters effective communication with students. Implementing a Learning Management System towards effective student learning processes enables students to improve upon their academic weaknesses. One of the faculty members shared their views:

> *"So overall as far as I am concerned, I am very much satisfied with CMS system as it plays a very positive role in adjusting our teaching methodology and curriculum according to the needs of students (F-2)".*

Coupled with teachers' benefits of time management, administration of course and teaching-learning resources, and students' benefits of improving timely study plans, improving upon real time feedback and time management and maintaining study-life balance enabled the ERP systems to exert a positive impact for both teachers and student performance as narrated by one of faculty member:

> *"I have also made my class more interactive, previously, it was less interactive, but, by time I am become more and more mature in teaching and listen the whole process, I come to know we cannot let the students just sit in the class room and be silent, so now my current methodology has been more discussion oriented, and that is also improved by teaching evaluation from the side of students, that is my personal experience (F-2)".*

To students, it fosters effective communication about their on-campus performance and academic progress. One of the respondents said that CMS and LMS enable both students and teachers to apply contemporary learner-centered approaches towards the teaching-learning process. It connects students with teachers and enhances coordination through instant student feedback, which improves student-learning process.

4.3.3.3 Course Management

The implementation of the ERP system has had a positive impact on course management. Soliman and Karia (2015) mentioned that the successful implementation of ERP systems are that they support the academic activities such as scheduling, learning processes and performance indicators. This was also made clear in the research interviews. Responses obtained from qualitative in-depth interviews revealed that both student and teachers considered formalized feedback and continuous tracking of course administration including course contents, classroom delivery and course assessment as the most appealing aspect of ERP. The main reason the university adopts ERP systems is

to replace old legacy systems, improve customer service and transform enterprise processes. Along these lines one of the faculty respondents put:

> *"It must be kept in the knowledge of the management that how much the course feedback has been done, and one more suggestion although it is not strongly related but the course outline, that how much topics mentioned in course outline we religiously following in assigned courses it if could also may be the part of CMS not only this part but some other features could be added (F-3)".*

Faculty member respondents indicated that the emergence of CMS and LMS has brought substantial improvement in the student course evaluations. It provides more formalized feed-back for reviewing course contents and their delivery. It helps in effective decision-making by management by collecting data on student-teacher activities. The implementation of ERP has brought visible improvements to the academic processes and streamlined many student services such as attendance and grade recording, online registration or withdrawal in courses, e-payment of fees and courses scheduling and examinations.

4.3.3.4 Better Communication

Most of the respondents suggested that the introduction of ERP systems particularly CMS and LMS has improved the communication and feedback mechanism, which has brought operational efficiencies for both teachers and students. It fosters effective communication of program learning objectives and course learning objectives to students and enables them to keep track of their performance and academic progress. It facilitates HODs, coordinators and management to gather student opinions about teachers' performance and their implemented teaching methodologies. Subsequently drawing upon this communication mechanism feedback, it provides opportunities to teachers to tailor and alter teaching performance according to contemporary educational and societal needs. However, there are also challenges as it costs time to input the data as explained by one the faculty member respondent:

> *"I think it has **improved the communication** because you know everything is **automatic,** when you want to enter the marks, so if I have like 50 students, so if I have to enter the marks for 10 students including assignments, then I enter the value by value, I mean when I enter the value 100 students and tell feedback yes enter, yes enter, so I have to spend half an hour entering the marks so that's one challenge, so entering marks is a challenge for me and then if you post the date it is also complicated, so **entering the marks is a bit of a complicated process**. Otherwise, yes, it has **improved communication** because everything goes into a database and you can do analytics on that, everything becomes secure and you have your own account (F-4)".*

Furthermore, the ERP system enables the institution to link systems, which generate data about holistic performance of teachers and other internal stakeholders, such as program Coordinators, HODs and academic and administrative committees who draw upon this data to improvise the system according to both Vice chancellors. As explained by the Vice Chancellor:

"The QEC department analyzes the results and develops very comprehensive report faculty-wise and department-wise. These reports were discussed in management meetings and performance of the faculty members in the assigned courses discussed. The open-ended remarks about the course improvement are discussed in the management meeting. The faculty members who's performance is below certain benchmark, they are assigned some mentors and asked them to attend the scheduled training sessions (VC-1)".

The ERP systems improved the communication, and timely access to reliable information from different departments of the university. It is a better way for communication and managing information than was used before.

4.3.3.5 Academic Process and Performance

One of the themes emerging from the interviews was the effect of ERP on existing teaching methodology. Most of the respondents found that it brings a substantial shift in pedagogy. The approaches and teaching philosophy traditionally followed were challenged due to the introduction of the ERP as it enabled CMS and LMS systems and gave students an option to provide feedback on the teaching. It directed teachers to follow a paradigm shift by following more realistic approaches in course planning related to

National Standards, handling of classroom discourses to student evaluation. For example, one of the respondents (Heads of Department) explained:

> *"I think that **some of the level of attainments are already well defined by the University for each course**, so teachers are always trying to keep that benchmark and try to attain that level, and measurement is done though QEC evaluation by getting student feedback, if one see that some areas are going down, especially if some students say that we have basic **pedagogy (Teaching methodology) issues, issues with the delivery of lecture or contents.** The HoDs discuss the issue with the faculty members to take immediate remedial measures and help the faculty member to **improve the weak identified areas**, but if there is an issue with schema that need to be discussed in the faculty council and academic council meetings to take corrective measures and these steps may takes more time but try to improve that according to the suggestions (H-3)".*
>
> .

It is the system that enables student feedback, which suggests that teachers should adopt alternative teaching strategies. However, respondents suggested that there is a need for continuous training on the use of the LMS as it will add value to the existing academic process. The respondents supported that after the implementation of the ERP systems the classroom pedagogy has been improved.

4.3.3.6 Teaching Methodology

The effect of ERP on the existing teaching methodology was one of the themes that emerged during the interviews. It unfolded the discussion about a shift in classroom teaching approaches. The responses revealed that the ERP system enables changes in the adopted pedagogy and teaching methodology. The changes came through teachers' becoming more aware of contemporary discourses of administering the courses and academic operations. Respondents were found in agreement that the new system improved teaching methodology evaluation and continuous improvement. However, as this participant suggested, a better administrative academic system does not necessarily improve the academic process itself. As explained by one respondent working as head of department:

> *"As a HoD we have multiple views, if I am representing the institution right now, then yes, it has helped because I get updated information, I can always, I suggest*

> *my team fellows that okay you change this thing and you try to improve this particular skill. But, when I see from teaching perspective, I mean I just need feedback, it could be from many sources or through many channels, like for example, at times, students are smart enough that they come up and they give feedback to teacher, that he should try to improve or he should try to cover more topics, so this apart from just a channel, but from institution, yes, it has helped, that I am able to see a bigger picture that how the department is working and how my colleagues are performing (H-4)".*

Respondents revealed that their definition of quality education altered after implementation of ERP enabled systems. They further added that improvisation, flexibility in approach and a positive competitive shift from existing teaching methodology was due to objective feedback obtained from the system, as explained by one of the faculty members as:

> *"Overall this ERP and especially CMS aspect of this ERP seems very much* ***encouraging in teaching and learning process of our university****. The first thing which I have seen is that there is* ***transparency****, because the students give specifically the ideas you are asking the online question they fill in without any kind of interruption or any kind of interference of any other party, so they have their own whatever process they have observed throughout the process they are doing it, and definitely,* ***it has a huge impact because once this evaluation is shared with faculty after the submission of the results****, specifically it focus upon the weak* ***areas which the students highlight****, that these were the weak areas because as a teacher when you reflect back I know* ***what my weak areas were through out the semester,*** *but I get it* ***authenticated by the students feedback****, then I put them into my areas to improve. For example, few semesters back I was notorious among students for* ***not submitting the results on time*** *so they continuously give this feedback because of this* ***my evaluation went a bit lower*** *but I have now worked and try my level best to give the results to the students within the first week of the exam done so, yes,* ***it is good job*** *(F-1)".*

The faculty members and HoDs agreed that feedback given by the students at the end of semester has improved the teaching and learning process at the university.

4.3.3.7 Feedback Mechanism

Reponses revealed that most of the changes in teaching and academic administration occurred owing to critical feedback obtained for improvement (Shatat, 2019). This feedback enables top management, including HODs, and the Vice Chancellor to devise competitive strategies and align the core operation with the world's best practices and

industry requirement. This system provides higher management with an opportunity to collect faculty feedback on their adopted methodology (Vincent, 2017). It is the coupling of an instant student feedback mechanism with lateral coordination. The system facilitated the development of new effective feedback forms carrying more reliable and valid rubrics. One of the respondents working as head of academic department advocated for good quality critical feedback as it enables their teaching staff to change style and methodology. It also facilitates HODs to effectively and efficiently allocate courses, and identify any training and development needs for teaching staff as suggested by one of the Vice-Chancellor participants:

> *"Yes, the minimum 70 percent score is considered as acceptable in a given course. If the feedback goes below 70 percent than these cases are first discussed at the management level, than by the HoDs at department level to individual faculty members. In such identified cases the management may change the faculty members for the course to be offered in the next semester or suggest the faculty members to go through certain training modules (VC-2)".*

The top management device the strategies and the next semester planning based on the feedback report created through the ERP system at the end of each semester. As informed by one participating university, the VC did not assign the same course to continuously low performing faculty members in student evaluations and management advised them to attend training sessions in identified areas to enhance their practice.

4.3.3.8 ERP GUI Interfaces

Despite the above findings, the existing interface of the ERP creates a bottleneck for substantial value-addition. Most of the respondents from multiple categories discussed how poor the user interface is and that most features of the system were not user friendly, creating impediments to effective implementation and utilization. One of the respondents working as faculty member said:

> *"Actually when we insert some words then there we realize, it is* ***not user friendly,*** *why because when we insert dates earlier it took into auto saved but now it is not getting auto-saved once you are doing 40 students and they are inserting in*

> *sequence marks this makes if something happens with the 38th entry if your browser gets failure, so again you have to refill and insert again the marks. So that* ***AutoSaved*** *needs to be implemented, so that, whatever work you do that work must AutoSave (F1)".*

However, respondent's heads of the academic department and Vice-Chancellor advocated for a proper feedback mechanism that provides data for the system improvement and training needs. It would enable efficient and effective utilization of the system. As explained by one of the Vice Chancellor participant as:

> *"The feedback is collected at the end semester from students by the QEC department. The QEC analyze the data department-wide, course-wide and faculty-wide. The QEC develop comprehensive reports after the analysis of the data. These reports are discussed at management level meetings in a detail.* ***On the basis of feedback the management make the decision about the distribution of courses for next semester****. The feedback helps to redesign the course contents and selection of faculty members for the courses to be offered in coming semester. The feedback is also considered as one of the factor for annual performance appraisal of the faculty members (VC-2)".*

ERP systems have poor Graphical User Interface (GUI) support that hinders the users to perform daily tasks on ERP effectively. The users informed that for performing a small task on ERP a lot of information needs to be entered. This finding can help improve the system.

4.3.3.9 Strategic Planning and Decision Making

The responses from Vice-Chancellors revealed that ERP contributed in formulating a competitive strategy and taking effective decisions for top management. Quoting Business Intelligence (BI) reports that were obtained and compiled through ERP enabled the system to contribute to alternative actions for strategic planning and decision making (Soliman & Karia, 2016). The two Vice-Chancellor respondents advocated for the system needs alignment with the vision and mission of the university. Any customized user interface and set-rubrics need to be aligned with what an institution wants to achieve. It enables management and HODs to carry out effective course management. The effective and constructive feedback mechanism developed through the

ERP system generates sound data, which in turn is being employed for planning and decision-making. As stated by the Heads of academic departments respondents said along these lines that ERP helps in effective and authentic management decision making by observing each activity of students and teachers:

> *"Sometimes I see the student's average grades, I have access to see, I can't change anything but I have access to see whether teachers are taking attendance or not, before that I had the information who is doing what, and what are their average grades, but sometimes when I have to see how the teachers and subordinates are performing, I see their* ***attendance****, and I see that whether they are* ***marking attendance*** *or not, because every day a person's report is generated and monthly reports are also generated, so this helps me to see who is punctual and who is not, who is sincere and who is not, this tells me the overall picture of my department,* ***this is fantastic*** *(H-1)****"****.*

> ***"------ so, I mean it is helpful in decision making, and above all, it not only captures particulars on the feedback, but we can get the trends in the results which are coming from the external****s, we have a CMS, we can see on each and every subject how students are performing. We can compare different batches that launch this subject, and how students perform these trends, their graphs and we can then improve not only subject allocation but we can also improve schema, which is a core thing (H-3)".*

Most of the responses obtained from top management revealed that ERP and its enabled systems enhances students' involvement which helps in the decision making process by consistently observing student responses and academic performance. They further added that aggregated data in the form of charts and plots, obtained through ERP, helps in quick decision making (Aremu, & Shahzad, 2015) as narrated by one of respondent working as Vice Chancellor of the participating university:

"*After the implementation of Business Intelligence (BI) reports, ERP supports the decision-making. For example some student approach for financial assistance, I can view his/her progress in the courses through CMS. If some faculty members apply for higher studies or some training or grants, I can see his past academic progress in different courses. The online performance appraisal of the individual faculty members helps in making the management decisions (VC-1)"*

The Business Intelligence (BI) reports generated on ERP help management to take decisions regarding academic and strategic planning of the University. It minimized the paperwork and created an automated environment at the university.

4.3.4 Analysis of Qualitative Analysis NVivo Software

The interview transcripts data obtained from interviews with faculty members, heads of academic departments and Vice-Chancellors were analyzed through NVivo Software. NVivo Software is a powerful qualitative analysis tool that gives easy access to word frequencies, key words in the contextual analysis, which helped in identifying various patterns in data source (Siccama & Penna, 2008).

4.3.4. 1 Word Cloud

Following my philosophical position of being interpretivist and relativist, which requires a researcher to perform a role with the research instruments, my analysis was employed in data structuring and analysis, which produced the above findings, and the preliminary analysis. However, in order to ensure the qualitative quality criterion, NVivo was also used to obtain mapping of data and their patterns and emerging structures.

Figure 15: Word Cloud

Word clouds are graphical representation of word frequency that give more prominence to words that appears more frequently in source text. The larger the word in the visual the more common the word was in the transcript documents. This can be used for communicating the most salient themes in data reporting and discussion phase (O'Neill, Booth, & Lamb, 2018). The above word cloud (Figure 15) obtained through NVivo confirms the data patterns used through the data structure to findings and analysis. The above-portrayed findings confirm the thematic patterns obtained from the NVivo generated world clouds. Furthermore, NVivo generated auto-coded themes, and word frequency mapping (given below) which reinforced the reliability and validity of the above mentioned qualitative data findings and analysis.

4.3.4.2 Tree Map of Contextual Factors

Long at el (2017) stated that a tree-map shows hierarchical relationships through a set of rectangles, sized proportionality to each data point, and clustered into one large rectangle. The rectangle screen space is divided into regions, and then each area is divided again for each level of hierarchy (O'Neill, Booth, & Lamb, 2018). The nested regions show hierarchical relationships and allow for quantitative comparisons of attribute values. A second variable for each category can also be coded using color (O'Neill, Booth, & Lamb, 2018).

The tree-map depicts all the contextual factors that were identified for the success of ERP in higher education (Siccama, & Penna, 2008). The Tree Map shows the significance of each theme identified in the study as shown in Figure 16. The factors shown in the big regions have more significant influence on ERP compared to those contextual factors in small areas of the Tree Map. The research study found student course evaluation, feedback, academic processes and teaching as more significant factors compared to support and training (Ijaz, et al., 2014). The columns themes shown in Figure 16 also support the main contextual themes generated from the thematic analysis.

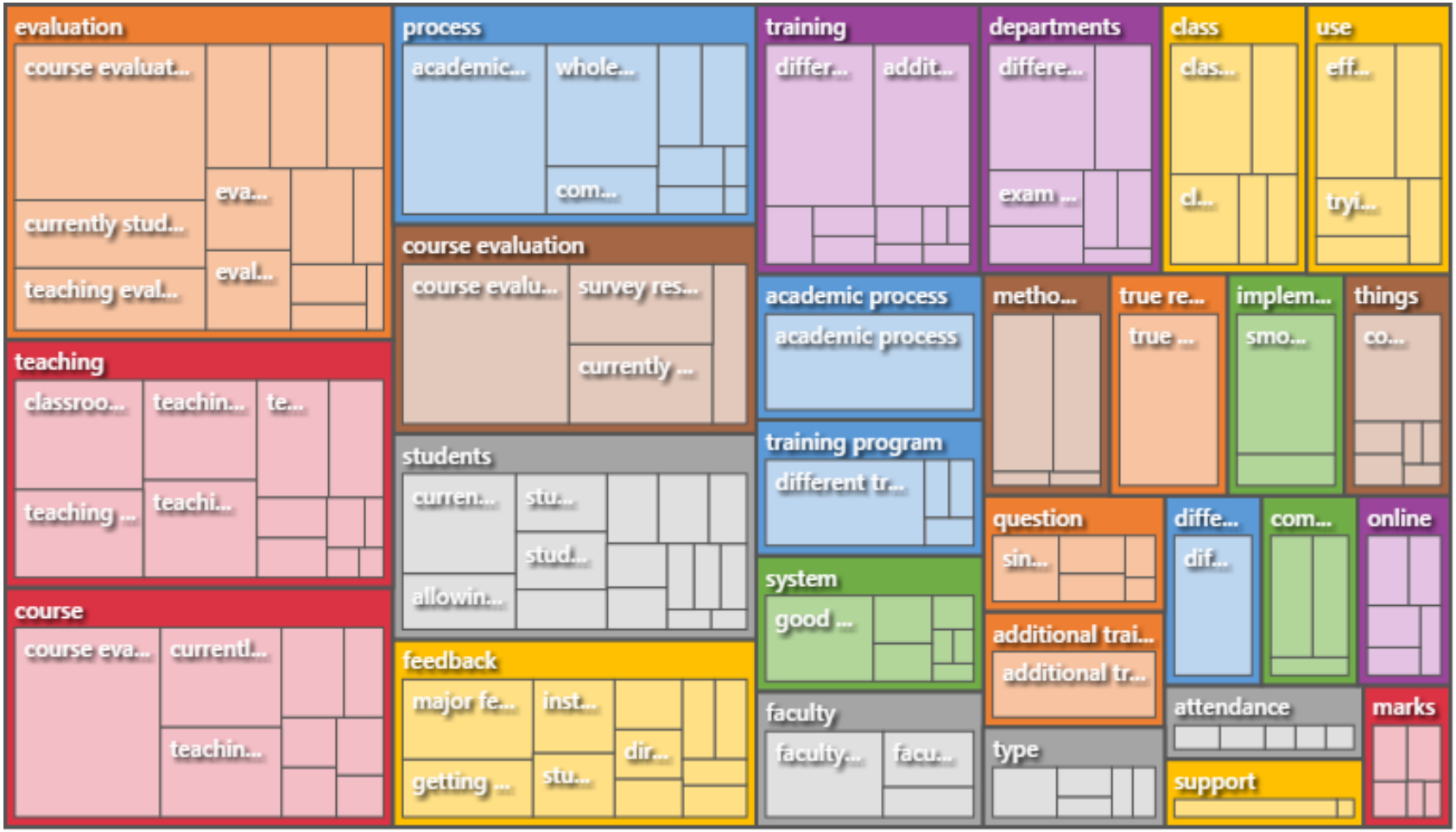


Figure 16: Tree Map of Contextual Factors

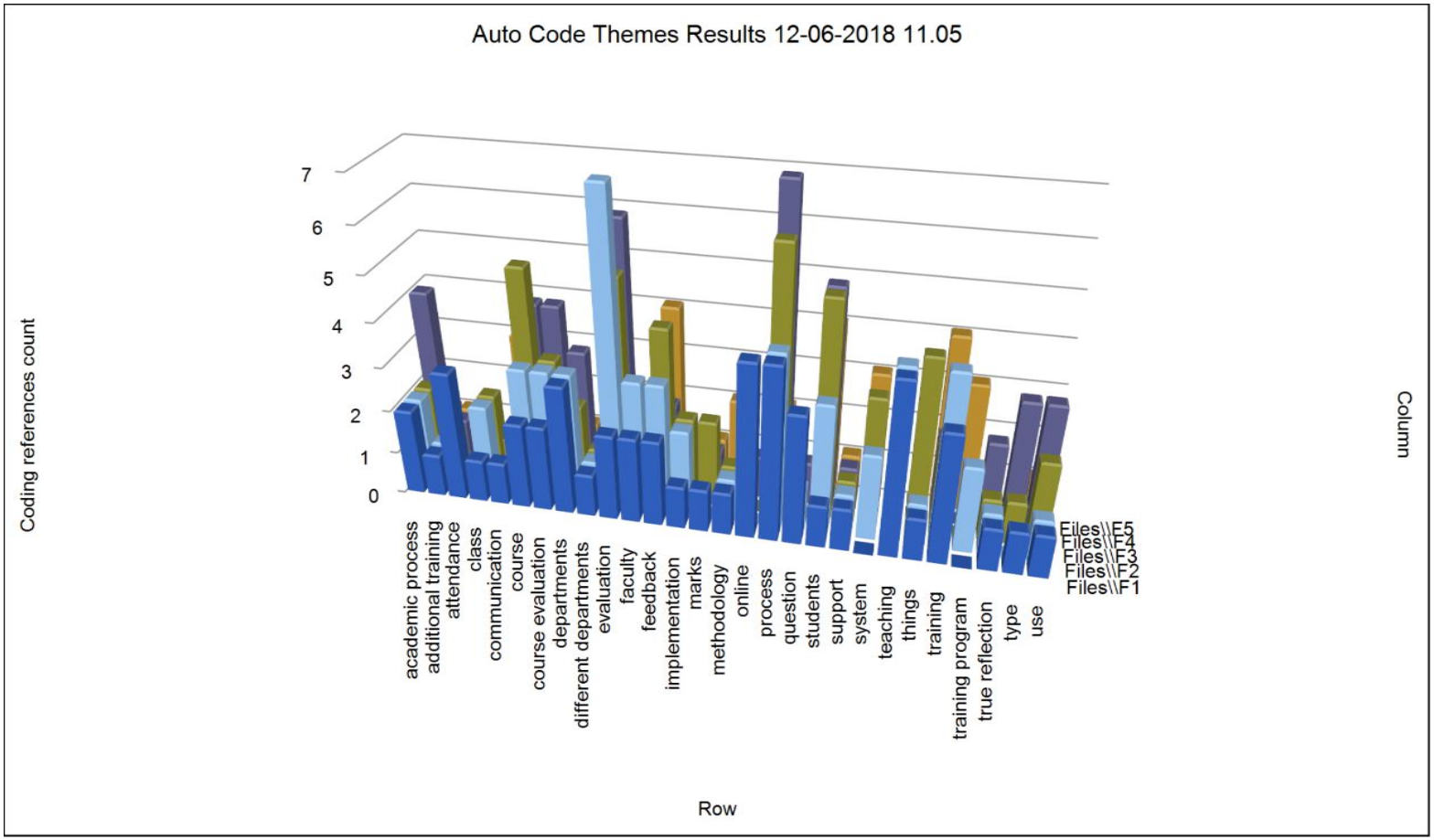


Figure 17: Auto Code Themes

4.4 Summary

This chapter presented the results of the overall findings of the research study. The main purpose of these analyses was to answer the relevant research questions and empirically test the research hypotheses. In the first part the quantitative analysis was shown using the Partial Least Square-Structural Equation Modeling (PLS-SEM) techniques. The data were analyzed using different analytical techniques to present the main findings of the study. The Indicator reliability, convergent validity, discriminant validity, and Internal Consistency Reliability were performed with the purpose to examine statistically the hypotheses, which were formulated in chapter-03. In total 12 hypotheses were examined, out of which 10 were supported and 2 hypotheses (H_3 and H_{10}) were Not Supported. The SPSS statistics package was used for the screening phase, including checking the missing data, finding outliers ad testing normality of data distribution.

The results of the research study were that all independent variables have a positive association on dependent variables user satisfaction, Perceived Net Benefits and Impact of ERP. The results indicate that information quality, service quality and system quality, perceived net-benefits and Impact of ERP are valid predicators of Impact of ERP in higher education institutions (Romi, 2013). The model (see Figure 13 and Table 5) accounted for 48% of the variance in impact of ERP, which was explained by system quality, information quality, service quality, user-satisfaction and perceived net benefits; 61% variance in perceived net benefits, which was explained by system quality, information quality, service quality and user satisfaction; and 35% of variance in user satisfaction, which was explained by system quality, information quality and service quality (Wang & Liao, 2008). The overall study results were that ERP systems have a significant impact in in the selected sample universities.

This chapter also presented the findings of the second, qualitative phase of the data collection that provided more detailed insights from research participants of the sample universities. Qualitative data was collected through 12 in-depth semi-structured interviews conducted with faculty members, Head's of Department/Dean's and Vice-Chancellors. The qualitative data was analyzed through transcription and data coding.

Different themes of the study were identified. Nine themes emerged from the quantitative data analysis: *Teachers' Performance, Students' Performance, Courses Management, Better Communication, Academic Process and Performance, Teaching Methodology, Feedback Mechanism, ERP GUI Interfaces and Strategic Planning and Decision-Making*. The next chapter will discuss the findings of both phases and link them with the research questions and with the support of previous studies in order to reach at final conclusion

Chapter 5 – Discussions

5.1 Introduction

In this chapter I will discuss the results of the study in relation to the literature, but also in relation to the research questions. The general questions of the research study were explored in the quantitative component of the study. This part explored sub-questions one (What, if any, are the benefits of the ERP systems to meet student academic needs? One: Do students find the ERP system easy to use?). Sub-question two: What, if any are the benefits to support faculty in the HE academic processes after the ERP systems implementation compared to earlier manual systems? and three: What, if any, are the challenges faced in achieving the improvement of academic processes after the ERP systems implementation from both a faculty and student perspective? This was the component of the research study related to the improvement of academic processes. The qualitative part also explored the third research question: What, if any, are the challenges faced in achieving the improvement of academic processes after the ERP systems implementation from both a faculty and student perspective? The fourth sub-question related to the improvement in teaching methodology after getting feedback on course evaluations and the fifth sub-question related to possible improvements in the higher education leadership decision-making processes after the implementation of ERP systems. As explained in detail in chapter-04, the research study used a sequential explanatory mixed method approach to explore the research questions in depth. Following sections will discuss the quantitative and qualitative findings of the research study.

5.2 Quantitative and Qualitative Discussion

The current research study was to measure the impact of ERP systems on academic and administrative support in the higher education sector of Pakistan. As explained in chapter-03 and chapter-04 in the quantitative part, 500 questionnaires were sent by email to participant in different academic departments of two selected universities in Pakistan. A total of 373 filled questionnaires were received back. For the quantitative data analysis, the Statistical Package for Social Sciences (SPSS) Software was used to

first clean the data by handling missing values, outlier assessment, normality assessment, multicollinearity assessment, common method variance assessment and descriptive analysis. Next, the present study employed Partial Least Square –Structure Equation Modeling (PLS-SEM) techniques using the SmartPLS 3.2.8 (Ringle et al., 2015) Software package to conduct validity and reliability tests and to generate path coefficients for testing hypotheses.

In the qualitative part, data were collected through twelve semi-structured interviews with faculty members, heads of academic departments and VC's. The purpose of these semi-structured interviews was to explore what might be the impact on teaching methodology of course evaluations done at the end of each semester in the ERP systems from a faculty perspective and what might be the impacts in higher education leadership decision-making after the implementation of ERP systems from a management perspective. This was done through an analysis of contextual factors related to the impact of ERP on academic processes and administrative decision-making. Different themes were identified and eventually different nodes were developed based on different contextual factors (Teo, 2017; Braun and Clarke, 2012).

5.2.1 Impact of ERP on the Improvement of Academic Processes

The ERP system is an information management solution that integrates and automates admissions, registration, financial aid, student records and most academic and administrative services (Rico, 2004). Rico (2004) mentioned that top reasons for universities to adopt ERP solutions are to replace legacy systems, improve customer services and increase the operating efficiency. The following sections discuss in detail the impact of ERP system on academic processes.

5.2.1.1 Benefits to Students to Meet Academic Needs

The benefits of the ERP implementation in higher education are that all the academic and administrative processes are standardized and systems have less cost and risk compared to legacy system (Pollock & Cornford, 2004). Abugabah & Sanzogni (2010) stated that universities use ERP systems for the support of academic purposes, while industry use the ERP systems for business purpose.

In Pakistan, higher education institutions are evolving and constantly improving the processes to cope with the challenges of the changing global economy. The literature suggests that ERP implementations have a positive impact on the overall student performance (Noaman, & Ahmed, 2015). This was supported by the data from this research project. The ERP system data collection improved the pedagogy and fostered effective communication with students. Faculty members had access to student feedback that helped them to improve the course contents, teaching methodology and assessment criteria. As was stated by one faculty member "….*with CMS system as it plays a very positive role in adjusting our teaching methodology and curriculum according to the needs of students"*. The CMS system provided access to student details that allowed to see the classroom timetable, attendance and results. The students themselves could see their results through self-service, they could see their fee status and could register or withdraw from any course. Students have fostered effective communication about their campus performance and their academic progress (lodhi, 2016). Previously these administrative tasks were done manually and were a time-consuming process. The students now have access to their grades during the semester and can view the classroom attendance. The students can view the fees due for themselves and can print bank deposit slips or online deposits for the semester fees. The empirical evidence in the quantitative analysis supports all the main themes discussed and showed that the CMS provided a smooth flow of information regarding the academic calendar, assignments and announcement of results. It also showed that the system quality (Ease of Use, Access, flexibility, accuracy and sophistication) had a significant positive effect on the user-satisfaction, which supports the findings by Petter, DeLone and McLean (2008). The CMS improved alerts to students on attendance and results to help them with their time management. In addition, it highlighted that the feedback and support was always available for resolving the ERP related issues by the technical support team. Students and faculty members made clear through the research that they received the required ERP related training to perform academic tasks effectively. The ICT department arranged training for all new CMS users during the orientation sessions. In case of any query or technical problem, the ICT team support was available during the daytime. The results

were consistent with studies reported in the literature such as Nizamani et al. (2017), who studied the CSFs in the context of Pakistani universities for the successful implementation of ERP systems. Sadiq (2016) discussed the post implementation factors for the successful implementation of ERP systems in the context of developing countries. The article investigated the success of ERP systems in the context of Pakistan. It identified that training and technical support to end-users is the key to effective implementation of ERP systems in any organization. The end-user participants in the current study similarly identified these factors. Lodhi (2016) discussed the critical factors that influence the successful implementation of ERP in Pakistani industries. The study used a mixed methods approach and identified different contextual factors i.e. organizational, technological, individual, and environmental factors. These identified variables helped the researcher in understanding the impact of different internal and external forces on the successful implementation of ERP systems. Karia and Soliman, (2017) discussed the possible beneficial factors in the higher education sector after the successful implementation of ERP systems, such as improved information and knowledge management, while Kelle (2006) supported the use of a mixed methods approach and the purposes of method integration for the validation of research findings, which showed that the methodology used in my research project is aligned with research objectives. Teo (2017) examined the tangible and intangible organizational factors associated with the implementations of ERP. This research revealed that increased control comes from the visibility of business operations and mission-critical information for executive decision-making. Similar themes were identified in ERP support in decision-making process by higher management (Teo, 2017). The findings of these research studies support the findings of my study that the ERP system helped with the automation and brought visible improvements in the academic processes and significantly improved many student services such as attendance and grade recording, online registration or withdrawal in courses, e-payment of fees and courses scheduling and examinations as compared to older legacy systems. The system streamlined the allocation and operations of academic processes.

Similarly, the system quality has a significant and positive effect on the Perceived Net-Benefits as an improvement in academic processes, feedback, communication,

reduction of the cost and increase access were found. Gable, Sedera, & Chan, (2008) support these constructs in the literature with similar research studies. For HEIs, one of the most basic desirable outcomes of the investment on ERP is improvement in academic and administrative processes when compared with the existing way of operating manually. Their research finding supports the statement that the perceived net benefits have a positive impact on the work of students and faculty members in their educational activities. In my research I found that such benefits especially include improvement in academic processes, providing of feedback, improved communication between different departments, cost reduction and increase in accessibility and decrease in data redundancy, which findings are also supported by Wei, Leong, Leong and Ooi, (2009) and Romi (2013).

5.2.1.2 Benefits to Faculty members in the Academic Support

Effect on Teacher's Performance: A major component of the current research was to see the effect of CMS and LMS investment impact on the improvement of academic processes. Most of the respondents suggested that the CMS supported their classroom teaching process. The CMS and LMS helped them manage the assigned courses in a semester effectively. Student's attendance and semester results were managed effectively compared to the old manual system. The authenticity and reliability of the data have been increased which helped them in improving the teaching methodologies (Ndung'u & Kyalo, 2015). The teachers now have access to the student feedback collected at the end of each semester in graphical report format, which helped the faculty members reflect on and identify their weak areas and change the teaching strategies in the upcoming semesters based on the feedback received. As stated by one of the faculty members during the interview, they have had the liberty to suggest changes in the evaluation form to the Quality Enhancement Cell (QEC) to get real feedback from the course participants. A few of the faculty members suggested that after feedback on the teaching strategies used, they have changed their approach from teacher- centered to learner-centered approaches. One of the faculty members talked about the importance of the training to faculty members on a continuous basis and support from technical staff for

handling technical issues. One of faculty members stated that *"… training from my personal experience is very good, we got lot of support…"*

The themes emerging from the qualitative data were consistent with the empirical evidence extracted from the quantitative data analysis. The Universities in Pakistan, which have fully functional ERP systems, are enjoying a higher reputation and trust of funding agencies compared with universities that are still using a manual legacy system. The above findings of this research study are consistent with similar studies in the literature (Vincent, 2017; Visser, Biljon, & Herselman, 2013; Ullah, Baharun, or Siddique, & Bhatti, 2017; Seo, 2013). The recurring themes of the project were (a) Reliability and authenticity of data (b) improvement in academic processes (c) better quality feedback by students.

The empirical evidence showed the significant and positive impact of the ERP information quality on the user satisfaction. ERP Information quality is the degree to which the information presents the required benefits (Romi, 2013). Some of the constructs from the findings are also highlighted in the literature, including relevance, accessibility, ease of learning, appropriateness, security of information and authorization (Petter, DeLone & McLean, 2008; Abugabah, 2010; Al-Debei, Jalal, & Al-Lozi, 2013; Alzahrani et al., 2019; Gable, Sedera, & Chan, 2003). The major concerns mentioned by ERP users were relevance and accuracy of information retrieved from the ERP. The faculty members were concerned about the security of information and prevention against unauthorized access to their account or information. However, it also involved easy access to reliable information and easily configurable interface designed as per user choice (Livari, 2005; Sadiq, 2016). User satisfaction is one evaluation mechanism for determining the ERP system success. The key-user satisfaction is an important metric for measuring the success of ERP systems (Wu & Wang, 2007). User satisfaction refers to the recipients response to the use of the IS's output. It is associated with attitudes toward the IS, which include: sharing of information, updating the information, receiving feedback, integration of information, training to users and support by the IT team (Romi, 2013; Alzahrani et al., 2019; Gable, Sedera, & Chan, 2003; Livari, 2005). When comparing this with the findings of my study, it is clear that the ERP provided improved support to faculty members in maintaining student records related to attendance and

grades. The student feedback had a positive impact on the improvement in classroom pedagogies. The information on the ERP is secure and safe, and no unauthorized persons have access to user data. In case of suspicious activity on an ERP account, alerts are generated to inform the user. Similarly, information quality had a significant and positive impact on Perceived Net Benefits. These findings were consistent with similar studies in the literature (Michel et al. (2019); Nizamani et al. (2017); Ojo (2017). Rani (2016) for instance stated that ERP systems for higher education were developed in a direction to support the key administrative and academic services, which was similar to my findings.

5.2.1.3 Challenges Faced in Improvement of Academic Processes

One of the challenges is to ensure authenticity and quality of the Information: Clearly, if the information produced by the ERP system is more reliable, authentic and secure this will benefit the ERP users in the form of improvement in academic processes, improvement in the communication and enhancement to the access of information. The participants of the research made clear that the availability of authentic and secure information at their fingertips has improved the decision making process by higher management. For instance, access to the feedback given by the students in report format from the ERP, that included tables and visualizations, helped the faculty members identify their weak areas. The University management used that feedback for better semester planning and decision-making about the training and development requirements of faculty members. ERP has improved the performance of the Pakistani universities where the ERP system had been implemented compared to universities, which still use a legacy manual system that involves manually doing all the tasks that the ERP system now performs in the institutions that have implemented the ERP system. Moreover, the empirical results showed the significant and positive impact of the information quality through the impact of ERP implementation. These issues were also highlighted in the literature as being significant when implementing a new information system (Rabaa'i, Bandara, & Gable, 2009; Romi, 2013; Rahman,2019). Information quality is an important ERP variable related to reliability and authenticity of the information, which has shown high support on the improvement of academic processes compared to manual systems.

***End-User Access to Information*:** The research study found a positive impact of service quality with user satisfaction. Service quality is considered as a set of services rendered by the ERP system to the end-user customers. The constructs, which are refined through comparison with the literature, include: reliability of service, availability of information, smooth flow of information, and data accuracy. These same issues were highlighted in the literature (Romi, 2013; Rabaa'i, Bandara, & Gable, 2009), Nizamani et al. (2017). Reliable and authentic information is accessible to students and faculty members. Students have access to grades, fees status, examination schedule and announcements of result information through ERP self-service. Faculty members have also access to the academic calendar, exam schedule and announcement of results. All these levels of access to relevant information contributed to a higher level of student and faculty satisfaction as it saved them much of time and gave them the confidence that the information received was reliable.

***Training and Support Services to End-Users*:** The University ICT department provides technological support services on a daily basis, related to academic activities. The ICT department also arranges training sessions for the existing and newly hired faculty members related to the CMS/ERP services. The majority of faculty members at both universities in the research are young and ICT literate (Shoeby & Rehma, 2018) and there was no resistance in implementing the new technological innovations. Similarly, the research showed that the service quality had a positive and significant relation with the Perceived Net-Benefits. The ERP improved the flow of information between different departments of the University. The feedback given by the students through ERP helped the faculty members to improve or change their teaching practices and strategies in the upcoming semesters. The information available to students through the ERP self-service access helped students to monitor the progress of their studies and make timely decisions regarding withdrawal of courses during the semester. Students also monitored their attendance through ERP self-service. Moreover, the empirical results showed the significant and positive impact of service quality as one of the impacts of ERP. ERP showed significant improvement in the academic processes of the university with reliable and authentic integrated information provided by the ERP system. Student data integration and exchange between different departments has been increased and the

unique single login ID provided to each user to access the permitted services at the campus has helped with this (Petter, DeLone & McLean, 2008).

5.2.1.4 Effect on Course Management

The data from faculty participants suggested that the ERP implementation in the HEIs has supported the handling of different courses offered in a semester. The faculty members told during the interviews that courses could be scheduled in a better way compared to the manual system that was used previously (Shoeby & Rehma, 2018). One of the faculty members suggested that its tracking of the course contents and how much course contents is completed by them during the semester is effectively maintained through this system. This was further confirmed by one of the participant heads of academic departments who informed me that the system generates alerts if the required number of sessions were not conducted in a particular course and the percentage of course topics mentioned in the syllabus were not covered. This is useful to know in case the mid-term/final examinations of that course(s) may be extended till the completion of the required number of sessions. This is one of the quality assurance checkpoints to ensure completion of minimum course contents mentioned in syllabus and helps the smooth operation. Faculty members also explained that the CMS and LMS systems brought substantial improvements in the student course evaluations as one faculty members stated "….*rather than just asking single question on teaching pedagogy, they divide it into the further dimensions, and also improve the part or whether they allowing students to participate more or not and they agreed and also changed the form…* ". This led to improvement of the overall end of course evaluation. Findings of the quantitative data analysis supported the themes generated in the qualitative data analysis. ERP provided a smooth flow of information regarding academic activities. The ERP provided accurate and updated information related to classroom attendance and grades on a regular basis. Moreover, the ERP helped the students to improve the performance by generating alerts on attendance and grades. As explained by one of the faculty participants "…*Like students are getting the text for the attendance or six absences and they are getting warnings***"**. If student's attendance shows more than six absences in any course, the system sends alerts to students through the self-service system. Students have

instant access to semester grades that help them in making decisions about withdrawal from a course or on freezing the semester. The empirical results of the quantitative results highlighted that with the implementation of the ERP the classroom administration has been improved, including course contents, course delivery and course assessment. The students now have instant access to academic materials through the gradebook at any time. The faculty members can now manage the course folders manually for the quality assurance and accreditation bodies as the information is now retrievable through the CMS/LMS. The student feedback through the ERP system has been more formalized compared to the manual completing of forms at the end of the semester. This has led to improvement in academic and administrative processes. These results are more or less consistent with studies such as done by Seo (2013) who examined the risk factors and challenges involved for the implementation of ERP from the corporate to the university environment and suggests that the efficiency and transparency would be increased through a seamless integration of information flowing through different departments of a university, which is also supported by studies by Soliman and Karia, (2017); Abugabah (2010); Akhtar and Kalsoom, (2012), Usman (2014); Abugabah, Sanzogni and Alfarraj(2015) confirm this.

5.2.1.5 Impact on the Communication Mechanism

The findings of the qualitative data supported the notion that the likelihood of successful implementation of an ERP system, particularly CMS and LMS, have improved the communication and feedback mechanisms within the institution, which has improved the operational efficiencies for both the faculty members and students. The respondents perceived communication to be as a critical aspect of the ERP system. The respondents explained how effective the communication between different stakeholders was and how the ERP enhanced effective communication of the administration for instance with parents of the students and Alumni of the university. This was similar to the findings by Nizamani et al. (2017) who identified better communication between different stakeholders as the key to the success of the project. Sadiq (2016) encouraged the use of messaging tools for better communication with each other in an organization, while Lodhi (2016) talked about inter-departmental coordination as a critical factor for assuring

the effectiveness of ERP systems in Pakistani organizations. Furthermore, Karia and Soliman (2017) discussed ERP adoption among HEIs, especially in Egypt and mentioned that adoption requires great organizational, technological and business environmental commitment while Pollock and Cornford (2004) discussed the importance of communication between different university stakeholders to settle similarity/difference issues arising during the implementation of ERP systems. This leads to the importance of effective communication mechanism between different departments.

The ERP system improved the academic processes, improved the communication between different departments and enhanced access to reliable information. This was a significant improvement over the manual system where it was complicated for administrators to receive data on the educational and administrative processes. The ERP provided access to authentic information compared to the manual system used before and this was a huge improvement to support executive practice (Wei, Loong, Leong, & Ooi, 2009). The ERP improved the academic processes in the university, which also involved sharing of information between different departments as the services of different sections can be assessed through a single login ID. The feedback received at the end of the semester through the ERP helped the faculty members to improve the weak areas as there was concrete data available that indicated change was required that led to improved teaching methodologies (Vincent, 2017).

5.2.1.6 Poor ERP Graphical User Interface Support

ERP systems had been criticized for poor user interfaces over a long period (Eichler and Dostál, 2012) and when there are discussions around what makes ERP good or bad, few take into consideration the poor design/user interface or GUI support. For instance, in my research faculty respondents considered the repetition of logging similar information in the CMS as boring and as a time-consuming task. One respondent talked about the poor Graphical User Interface (GUI) support provided by the CMS that was also highlighted by Lameck, Muller, Fohrholz, and Leyh (2014). The respondent informed me that for performing small tasks on the CMS a lot of information needs to be entered into the CMS. In the quantitative data analysis, respondents' responses on similar questions on GUI support and CMS response, and on questions if the ERP is easy to use

or easy to learn, showed that because of its poor interface, sometimes software fails to serve its purpose and users are unable to make the most of the Software functionalities. Eichler and Dostál (2012) stated that poorly organized interfaces are a particular cause of user annoyance, disorientation, confusion and reduction of productivity. This is data that can help improve the system, even though it also showed that the ERP system improved the internal communication within the campus community.

Despite all these findings, poor graphical user-interface was one of the themes that emerged during the qualitative data analysis. The HoDs and Management explained that reports generated through the ERP system helped them in looking at the performance of the individual faculty members and to make decisions regarding the distribution of courses for the next semester. However, the respondents in the quantitative data collection phase highlighted that the ERP system provided poor GUI support and that the software design is not user-friendly. Two questions related to the ease of use and if CMS interfaces were easily configurable were answered negatively, which means that the designers of the ERP system need to pay attention to these issues especially as these notions were also reported in the literature by Abugabah, and Sanzogni (2010), Noaman and Ahmed (2015), Shatat (2019) and Thawabieh (2017).

5.2.1.7 Impact on Academic Processes and Performance

In Pakistan, few universities have shifted successfully from legacy old standalone systems to new integrated ERP systems to improve the administrative and academic efficiency (Shatat, 2019; Rani, 2016). Universities in Pakistan are struggling to enhance the professional experience and skills to their academic community by introducing and utilizing the new technologies in the teaching activities in an efficient way (Noaman & Ahmed, 2015). Shatat (2019) reported that ERP systems have a positive impact on academic performance and most of the respondents in the qualitative part of the research supported the notion that after the ERP/CMS implementation there is a substantial shift in improvement of teaching practices. During the course evaluation students were asked about the teaching strategies of teachers in the classroom. |The majority of the students rated that teachers had pedagogical issues and they did not follow the teacher's classroom lecture or content. This led to the HoDs discussing the problem with the faculty member

and take remedial measures to improve the weak areas. Some faculty members were advised to attend training sessions in new teaching skills. Before the implementation of ERP, these problems did not fully come to the surface or were properly communicated to the faculty members or management. The respondents identified that there is a need for training sessions to be arranged on the use of the LMS that will add value to the academic processes (Shatat, 2019). Nizamani et al. (2017), Sadiq (2016), lodhi (2016), Karia & Soliman, (2017), Abugabah, (2010) highlighted similar issues in their research.

5.2.1.8 Effect on Existing Teaching Methodology

The working of higher education institutions is different from other organizations. Universities have different features such as complex objectives, outputs that are hard to measure, and a scattered structure of units and authority. This mixture of characteristics makes the Universities "unique" compared to other business organizations (Shatat, 2019). The teaching methodology was one of the important themes that emerged during the qualitative data analysis. Research participants talked about the shift of pedagogy from a teacher-centered approach to a learner-centered approach and how this might be achieved. The participants agreed that the new system improved the teaching methodology and that continuous improvement had been witnessed over a few years. As an example, one head of an academic department said that after the implementation of the ERP system, they had access to a comprehensive report for all the courses taught in a semester. They could see a bigger picture on how the department was working and how faculty members were performing. The faculty members receive the feedback in course evaluations and the majority of the faculty members believed that feedback from students improved their classroom methodology and engagement with students. As informed by one of the senior faculty members "….*I was notorious among students for not submitting the results on time so they continuously gave this feedback; because of this my evaluation went a bit lower but I have now worked and tried my level best to give the results to the students within the first week of the exam done so, yes, it is a good job"* . The respondents in the quantitative stage of the data explained that the collection of feedback given by the students is a true reflection of the classroom teaching and suggested that the implementation of ERP/CMS has improved the academic processes in the university.

This is in line with the findings by Abugabah and Sanzogni (2015) who evaluated the impact of ERP systems on User Performance in HEIs. This study investigated the impact of ERP systems on User Performance (UP) in higher education. User performance measures efficiency, effectiveness and creativity of the participants (Abugabah & Sanzogni, 2015) and the results in this research study found that system quality, information quality, and task technology fit are important factors that lead to better quality, which was a similar fining to that of Noaman and Ahmed (2015) who critically evaluated the ERP systems in higher education compared to legacy systems to see how to avoid problems caused by legacy systems in higher education. Their research study recommended that ERP for business has a different set of functionalities. Therefore, the ERP venders should respond with new-featured ERPs that cater for the real need of higher education. Shatat (2019) conducted research to investigate the impact of ERP systems on academic performance at University. In their quantitative study, the participants use of the system was examined for the relationship between three core modules i.e students' information module, the financial module and human resource module and the research outcome found that students' information module and financial modules have a significant impact on academic performance and the human resource module shown did not have impact on academic performance, which was also apparent in my research study (Shatat, 2019). The study conducted by Thawabieh (2017) to evaluate the effects of student evaluation done by the Quality Enhancement Department (QEC) at the end of every semester had a similar research outcomes to mine, which indicated that the evaluation has a direct impact on the quality of classroom teaching. The results indicated that factors like gender, expected grades and learning environment have an effect on faculty evaluation (Thawabieh, 2017). Abugabah and Sanzogni (2010) critically reviewed the previous research in the ERP systems in higher education with a special focus on higher education in Australia. The researchers concluded that the ERP system has a positive impact on the improvement of academic processes in higher education, similar to this thesis research.

5.2.1.9 Continuous Feedback Mechanism Through Implementation

The ERP system provided a solution to integrate and implement best academic and administrative processes (Sabau et al., 2009). The student feedback was one of the most important themes that was discussed and was also most commonly identified as an issue that needs attention among the faculty members. The faculty members have divided opinion on what to do with student feedback. A few considered this a true reflection of their classroom teaching and classroom management. However, some considered it as biased and were of the opinion that this may not be considered as a criteria for the faculty evaluation. After the implementation of the ERP system, a comprehensive feedback was received from the students and a detailed report was generated based on that feedback by the Quality Enhancement Cell (QEC) of the universities and presented in report format to HoDs and Vice Chancellor who found it to contain useful information. The top management device strategies and semester planning were based on that feedback report. As explained by one research participant Vice Chancellor "*Yes, the minimum 70 percent score is considered as acceptable in a given course. If the feedback goes below 70 percent then these cases are first discussed at the management level, then by the HoDs at department level to individual faculty members. In such identified cases the management may change the faculty members for the course to be offered in the next semester or suggest the faculty members to go through certain training modules".* They suggested that the course evaluation could be considered as one aspect of annual evaluation. The faculty members suggested a few changes by adding new rubrics in the course evaluation form. The respondents in the quantitative part of the research supported that feedback given by the students in the course evaluation and suggested that it has improved the classroom teaching. These notions were also highlighted in studies by Abugabah and Sanzogni (2010) when they evaluated the impact of ERP systems in higher education at Saudi-Arabian universities. A major conclusion of my current study is that both Perceived Usefulness (PU) and Perceived Ease of Use (PEOU) of ERP systems have contributed significantly to ERP usage and performance impacts. This was also found by Noaman & Ahmed (2015) who suggested that ERP systems in higher education should be tailored to meet the academic functionalities and needs. Shatat (2019) conducted research to evaluate the impact of ERP systems on academic performance. Their research

results supported a positive impact on academic performance after implementation of ERP systems at selected university. In addition, Thawabieh (2017) supported that faculty evaluation is considered as one of the most important factors for any academic institution to ensure quality of teaching as this is considered as one of the factors to evaluate performance of the faculty by the decision-makers.

It was found from the results that the ERP impact had a significant positive effect on Perceived Net-Benefits (improvement in academic processes, feedback, improved communication, reduced cost and increased access) The findings are consistent with similar research studies by Abdellatif (2014), whose analysis indicated that ERP is beneficial to universities for replacing legacy administration and management systems in developing countries. Lodhi et al. (2016) investigated ERP effectiveness in business organizations, while Livari (2005) tested the D&M model and the results showed that system quality and information quality are significant predicators of user-satisfaction with the system but not system use. Nizamani et al. (2017) suggest that evaluated positive impact of feedback will improve the overall academic processes. These findings from the literature support the positive findings from this research project.

5.2.1.10 Contribution to Strategic Planning and Decision Making

A major portion of the qualitative research was to see if ERP implementation leads to improvements in higher education leadership decision-making from a management perspective. Chand et al. (2005) developed a framework based on a balanced scorecard to measure strategic contributions of the ERP system. During the responses from Vice Chancellors in interviews it was clear that ERP plays a pivotal role in formulating a competitive strategy and taking effective decisions by the top management. One participant university Vice Chancellor informed that Business Intelligence (BI) reports compiled and generated from the ERP helped the top management in their strategic planning and decision-making (Gabriel, Martha, & Juan, 2017). Two participant university VC's highlighted that the ERP system needs to be aligned with the vision and mission of the University. Moreover, the research also highlighted, as was done in the literature, that the role of top management in the successful implementation of ERP was key in the organization. As one of the

participating University Vice Chancellor stated "*Our academic processes focus on improving the quality of student intake, the quality of faculty intake, the quality of teaching and research, and the integrity of admissions and examinations. These are closely aligned with our mission of delivering high quality education"*

During the qualitative data analysis it was interesting to see that different participants saw different advantages of the ERP introduction. For instance, a head of the academic department participant informed me that ERP generates data from student feedback, which is being employed in the semester planning and courses distribution in the coming semester, which helps them in their planning. Another participant working as head of the academic department was more interested in receiving the reports on the attendance of the students in different subjects to monitor the courses progress in a semester. Another head of the academic department participant was very interested in looking at the grades of the students and the marks obtained by the particular cohort of students from the external examiners. This was different again from how the top management utilized the Business Intelligence (BI) reports in decision-making. One participant Vice-Chancellor told that when a student approaches the institution for financial assistance, the progress of that student could be viewed through the ERP system and an informed decision made. Moreover, when a faculty member applies for higher study leave and sponsorship by the university to pursue higher studies, the top management can again make the decision based on the performance of that faculty member, on semester feedback reports generated by QEC and the online performance appraisal system reports generated by HR department. The respondents in the quantitative component of the research confirmed that feedback given by the students is a true reflection of classroom teaching. The respondents suggested that the implementation of ERP/CMS has improved the academic processes in the university. These notions were supported by similar studies reported in the literature such as by Uçaktürk and Villard (2013). This current research study found that ERP systems are valuable in decision-making process in management to create a competitive advantage. Schindel (2018) conducted a research study for the implementation of ERP systems in higher education institutions. The findings of their study revealed that in HEIs there is shared governance, where various groups of people are involved in key strategic decision-making processes.

Moreover, Romi (2013) has empirically tested D&M model to measure the effect of information flows inside and outside the organization on the decision-making process. When comparing this with the findings of my study, it is clear that information generated through ERP supports the higher management in decision-making process, that influence success of the organization.

As stated above in my research few decision were made at head of academic department and strategic level, such as by vice-chancellor or strategic bodies like the Senate, Syndicate and academic council without using data generated by the ERP system (Abugabah, & Sanzogni, 2010; Shatat, 2019; Thawabieh, 2017).

5.3 Summary

This chapter discussed the results of both the quantitative and quantitative study findings. The first phase of the research findings clearly showed empirical evidence of ERP success in two selected universities of Pakistan. In the quantitative part, I examined the updated research framework based on the DeLone and McLean IS success model. Based on the empirical results indicated in chapter-04 and the quantitative results discussed above provided clear evidence that the participants were satisfied with using the ERP systems as out of six success measures (that were system quality, information quality, service quality, user satisfaction, Perceived Net-Benefits and impact of ERP) only the link from system quality to impact of ERP, ten hypotheses out of twelve were supported. The hypotheses in between system quality and user satisfaction and perceived Net benefits were supported. This means that the system quality was indirectly supported by the impact of the ERP.

The overall benefits accumulated by the HEC and the universities through the adoption of ERP system include streamlining the academic and administrative processes and provision of concurrent information to all the stakeholders. The findings of the research study support that ERP system helped with the automation and brought visible changes in academic processes, providing feedback, improved communication between different departments and significantly improved many student services compared to older manual systems. The ERP system brought benefits such as cost reduction, increase in the accessibility and decrease in the data redundancy. The research findings informed

that student feedback have very positive impact on the improvement in classroom pedagogies as informed by the faculty members. When comparing with a manual system, the information generated through the ERP system supports higher management in their decision-making processes that influence the success of the organization.

However, there were also challenges identified by ERP users in the accomplishment of academic-related tasks. Poor graphical user interfaces emerged as one of the themes during the qualitative data analysis. Similarly, in the quantitative data collection phase, respondents highlighted that the ERP system provided poor GUI support and that the software design is not user-friendly. Two questions related to the ease of use and if CMS interfaces were easily configurable were answered negatively, which means that the designers of the ERP system need to pay attention to these issues, especially as these notions were also reported in the literature by Abugabah and Sanzogni (2010), Noaman and Ahmed (2015), Shatat (2019) and Thawabieh (2017). The respondents identified a need for training sessions to be arranged on the use of the CMS that will add value to the academic processes (Shatat, 2019). Nizamani et al. (2017), Sadiq (2016), lodhi (2016), Karia and Soliman (2017), Abugabah (2010) highlighted similar issues in their research.

The results of the research study were that all independent variables (ERP System Quality, ERP information quality and ERP service quality) have positive influence on the dependent variables of user satisfaction, Perceived Net Benefits and Impact of the ERP. The overall study results found that ERP systems have significant impact in higher education. Several participants in the research study identified poor navigation and usability problems with the ERP systems. Participants identified that for performing specific task, ERP systems require large number of steps to complete a process.

The themes emerging from the quantitative data analysis were described above and were mostly supported in the qualitative data analysis. The next chapter will discuss the significance of the research, research contribution in theory and methodology, recommendation for practices, limitations of the study and future research directions. It also contains a personal reflection to highlight what I have learned from the current research work.

Chapter 6 - Conclusion

6.1 Introduction

This chapter begins with the summary of the research results gained, outlining the main themes and rationale of each chapter of this thesis. In the beginning, a summary of the research findings is presented based on discussions in chapter-05. Initially, the evidence gathered from each of the key findings are summarized and strengths of the findings are explained and elaborated upon. The implications for research and practice are analyzed in the context of the findings. Recommendations for future study and personal reflections about undertaking this research are also be shared. Finally, limitations of the study are presented and the chapter is concluded with future research directions and suggestions in this important area of research.

6.2 Significance of the Research Study

This section draws together a conclusion from the research findings and insights from the broader literature to support a clear understanding of the impact of ERP in higher education of Pakistan and recommendations for improvements. The current research study evaluated the existing literature to understand contextual factors that contribute to ERP system success and based on these contextual factors, proposed a research framework to make a reference to measure the impact of ERP in higher education universities of Pakistan.

6.2.1 Contribution to Theory and Methodology

Unlike the small number of research studies reported in the literature in higher education of Pakistan which have used preexisting IS models and mainly focused on Critical Success Factors (CSFs) and reasons for ERP systems' failure, this study further developed existing models and focused on success and how this is achieved. In doing so, an improved model is developed to support future research in a similar context.
The sequential mixed methods study is built on the integration of qualitative and quantitative findings and implications through triangulations to answer the research questions.

Ten out of twelve hypotheses were supported by the quantitative data analysis (Chapter-04 Findings). The quantitative research study results were that all independent variables (ERP System Quality, ERP information quality and ERP service quality) positively influence the dependent variables of user satisfaction, Perceived Net Benefits, and Impact of the ERP. Poor navigation and usability problems were the two main shortcomings identified from the participant's perspective. Apart from these challenges, the research findings clearly showed empirical evidence that ERP systems positively impact academic processes in two selected universities in Pakistan.

The qualitative data analysis developed empirical themes, which were merged to form nine conceptual categories, which are Teachers' Performance, Students' Performance, Courses Management, Better Communication, Academic Process and Performance, Teaching Methodology, Feedback Mechanism, ERP GUI Interfaces, and Strategic Planning and Decision-Making (Peng & Annansingh, 2013). Each has been analyzed separately, and the findings compared with the quantitative results and then assessed how this data expanded upon the quantitative findings (Chapter-05).

The results of the qualitative part added more credibility and an in-depth understanding of the quantitative findings. Qualitative themes emerged that ERP systems promote improved academic processes, have positive influence of student feedback on classroom pedagogies, better communication between different departments, cost reduction, and increased accessibility and decreased data redundancy. Qualitative findings also showed clear evidence that information generated through the ERP supports the higher-level university management in their decision-making process, influencing its success.

The chapter-05 Discussion chapter compared the findings of this research study with those reported in the relevant literature from similar studies, which are summarized in the next section. The conclusion chapter ends with the leading research contribution, personal reflection, limitations of the research, and suggestions for future directions in similar studies.

An interesting observation was that during the COVID-19 pandemic all universities moved their teaching online and the universities, which have provision and usage of ERP systems, had a clear edge over other institutions in Pakistan.

According to Almaiah et al. (2020) universities that had successfully implemented the ERP systems have shifted rapidly to distance and online learning, while universities, which do not have ERP systems had major challenges to achieve this as faculty needed to start teaching online and submit work on the course management system and had to transition from the university culture towards working from home.

6.2.2 New Knowledge

A theoretical framework was developed to empirically test research hypotheses involving the impact of ERP to service quality, system quality, information quality, perceived Net Benefits and user satisfaction. The results of the research study answered the research questions and showed a positive and significant influence of the ERP system on the improvement of academic processes in the higher education context (Romi, 2013). The empirical results in chapter-04 and the quantitative results discussed in chapter-05 provided clear evidence that the participants were satisfied with using the ERP systems, bar some navigation issues. The findings are consistent with the findings reported in previous research by Abugabah and Sanzogni (2010), Noaman and Ahmed (2015), Shatat (2019), Nizamani et al. (2017) and Thawabieh (2017). When assessing the impact of ERP on the improvement of academic processes some benefits to students to meet academic needs were identified, such as improvement in academic processes, providing of feedback, improved communication between different departments, cost reduction and increase in accessibility and decrease in data redundancy, similar findings were also supported by Wei, Leong, Leong and Ooi, (2009) and Romi (2013).

Similarly, from faculty participants' perspective, the research study results had shown that the ERP provided improved support to faculty members in maintaining student records related to attendance and grades. Faculty members thought that students' feedback positively impacted classroom pedagogies, assessment criteria, and course contents. ERP systems are designed to support the essential administrative and academic services (Rani, 2016). In the current study results, the faculty reported a high degree of confidence in the system, agreeing that system is secure and when suspicious activities are generated, the system generates alerts and informs them. These findings were

consistent with similar studies in the literature (Michel et al. (2019); Nizamani et al. (2017); Ojo (2017).

The results of demographic data analysis showed that the majority of faculty members at both universities are young and ICT literate (Shoeby & Rehma, 2018) and that there was no resistance to implementing the new technological innovations. This finding is specific to selected universities and can't be generalized to other HEIs. Similarly, the research showed that the service quality had a positive and significant relation with the Perceived Net-Benefits of the system. This resulted on the improvement in the flow of information between different departments of the University (Petter, DeLone, & McLean, 2008).

Information quality is an important ERP variable related to the reliability and authenticity of the information, which has shown high support on improving academic processes compared to manual systems. From a student perspective, the research study showed that ERP was seen by them as providing access to reliable and authentic information. The research showed a significant and positive impact of the information quality through the ERP implementation (Rabaa'i, Bandara & Gable, 2009; Romi,2013; Rahman, 2019). In the current study, students reported high-level of confidence in the system because they have instant access to grades, fees status, examination schedule, announcements of results, register or withdraw from any course through ERP self-service. Students informed that before CMS these tasks were done manually and were a time-consuming activity. One of the most significant findings emerged from the student perspective that CMS generates alerts on the number of absences and grades that helped them manage time.

The ERP was seen by managers as providing authentic and useful information to support executive practices as compared to the manual system used before, and this was a considerable improvement (Wei, Loong, Leong, & Ooi, 2009). From the perspective of students and faculty members, all levels of access to relevant information contributed to a higher level of satisfaction. It saved them much time and gave them the confidence that the information received was reliable.

The ERP improved the university's academic processes, which also involved sharing of information between different departments as the services of different sections

can be assessed through a single login ID. The faculty members informed that the feedback received at the end of the semester through the ERP helped them improve the weak areas as factual data available that indicated change was required, leading to improved teaching methodologies.

The participants of the current study reported that feedback and support were always available by the technical support team for resolving ERP related issues. The participants made it clear that they received the required ERP training sessions arranged by the ICT department to perform academic and administrative tasks effectively. So this is an important finding that anyone introducing an ERP system needs to be aware of and act on.

It was found from the results that the ERP impact had a significant positive effect on Perceived Net-Benefits (improvement in academic processes, feedback, improved communication, reduced cost and increased access). These findings are consistent with similar research studies by Abdellatif (2014), whose analysis indicated that ERP is beneficial to universities for replacing legacy administration and management systems in developing countries. These findings from the literature support the positive findings from this research project. The researchers concluded that the ERP system has a positive impact on the improvement of academic processes in higher education, similar to this thesis research.

A significant portion of qualitative research was to see if ERP implementation leads to improvements in higher education leadership decision-making from a management perspective. This current research study found that ERP systems were valuable in management's decision-making process to create a competitive advantage. For example one of the universities Vice-Chancellor suggested that the Business Intelligence (BI) reports generated on ERP helped management make decisions regarding the university's academic and strategic planning.

The department heads highlighted that ERP minimized the paperwork and created an automated environment at the university. One of the heads of the academic department informed that course folders were previously managed by the faculty members in each semester manually for the quality assurance and accreditation of programs, which were now easily retrievable through CMS/LMS.

The themes generated from the qualitative data analysis support that the top management bases their strategies and next semester planning on the feedback report created through the ERP system at the end of each semester. As shown by one participating university, the management did not assign the same course to continuously low performing faculty members in student evaluations, and management advised them to attend training sessions in identified areas to enhance their practice. Similar notions were supported by research studies reported in the literature such as by Uçaktürk and Villard (2013); Schindel (2018).

Summary

Nine contextual factors relevant to current research study emerged (see section 4.3.2) from the quantitative data analysis: teachers' performance, students' performance, courses management, better communication, academic process and performance, teaching methodology, feedback mechanism, ERP GUI Interfaces, and strategic planning and decision-making. Although there are several positive factors, which created a better impact of the ERP system used in these universities, and there is evidence that these universities are working well with the system. Research study participants identified several areas for improvement such as, poor navigation and usability problems with the ERP systems. Participants identified one more shortcoming that the ERP system requires many steps to complete a process for performing a specific task. These results can help adapt the strategies to improve user experience.

6.2.3 Contribution to Policies and Practices

The research study is useful in the local context for top management and higher education policymakers to buy and implement the ERP systems in HEIs in Pakistan. To create a high-level impact the study's findings will be shared with higher education leadership to support decisions making regarding the implementation of ERP in different HEIs of Pakistan in the future (Chuang & Chen, 2006). The key stakeholders of my research are the leadership of HEC, Vice Chancellors of different public and private universities, ERP vendors and IT managers in the universities. I intend to publish this research in reputable research journals and the research findings will be shared with HEC

facilitating them in formulating strategy and policies regarding the expansion of ERP systems in the remaining public sector universities. The outcome of this research study can be used to develop the future direction of ERP investment in the public sector universities (Tashakkori & Teddlie, 2010).

In addition, re-specification of the D & M model (2003) by focusing on the variables that have been linked to the ERP context and by introducing new variables that show the impact of ERP will enrich the literature on information system adoption. The current results can be extended to South Asian countries, which have similar economic and social background. Nevertheless, because of our sample size the results cannot be generalized or applied to all developed countries.

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6.3 Limitations of the Study

As with all research studies, there are limitations to this study also. However, these limitations could be converted into opportunities by future researchers. First, the number of universities used for collecting data may be increased from two universities to four or five universities in Pakistan that have implemented ERP systems to measure the empirical evidence of ERP systems in Pakistan and increase the generalizability of the results.

The role of the researcher could be considered as one of the limitations of the research study. As a researcher, I am working as a Registrar in one of the participating universities and may have influenced the results' outcomes. Although influence was mitigated by me having no direct influence on the respondents of the study as the survey questionnaire and the interview questions were designed in such a way to minimize the likelihood of influencing the research results. I explained to the participants the research objectives, that participation was voluntary, and that they could withdraw without penalty from the process. As explained earlier in chapter 01 and chapter-03, I don’t have any direct or indirect influence on the research participants (DuBois et al., 2012). My research objective was to understand the research topic and add to the body of knowledge.

Second, in the sample of participants in the data collection, the gender distribution was not balanced; it was unintentional, but in such studies, it would be helpful to have

gender-balanced participation. Doing so would pave the way for a more robust analysis through a dyad study.

Third, the ERP systems were implemented some years ago at some HEIs in Pakistan and it takes time to measure the real impact of the ERP investment. The future research results may vary from the current research study results as the IS system has had longer to be embedded in the university system with improved and upgraded versions.

Fourth, the current study used five success dimensions in the theoretical model for measuring the success of the ERP system i.e., system quality, service quality, information quality, user satisfaction, and Perceived Net-Benefits. However, more success dimensions of ERP success evaluation could be added, such as organizational and Technological/Innovation factors (Zouine, & Fenies, 2015; Ifinedo, 2006). By increasing more items, better results could be generated. Future research may be carried out using longitudinal studies to replicate the current study concerning time and long-term usage to ensure the findings' reliability.

Fifth, the study was limited in qualitative data collection, the survey findings showed some issues related to GUI and information extraction identified by the students, so in future research studies, sample students' may also be interviewed to explore these issues in-depth.

6.4 Recommendations for Practices

Being an educational practitioner and user of the ERP system in HEIs and based on the current research findings, the following recommendations will be made to the Higher Education Commission (HEC), Pakistan, Provisional HECs, and other decision-makers:

The current research makes a unique contribution to practice through rich knowledge and experience it shares with HEC decision-makers, vice-chancellors, and critical stakeholders.

Based on the study's findings, I would suggest that the HEC (2016) consider expanding the ERP system for all public sector universities in Pakistan because system provided visible support to stakeholders in academic and administrative processes. The ERP system helped the higher education management in making

improvement in decision-making processes. The research findings provided guidelines and clear evidence of academic support extended by ERP systems to students and faculty members at selected universities in Pakistan. I would suggest that HEC (2016) adopt a globally accepted ERP solution tailored specifically to support academic functionality. The ERP system could be hosted cloud-based centrally by HEC, which would reduce hardware up-gradating and maintenance cost of HEIs (Deshmukh, 2014). Current research findings suggest that adaptability and customization of the newly purchased systems are best done after getting feedback from selected universities end-users.

Despite these advantages of ERP systems, several participants identified poor navigation and usability problems with the ERP systems. Participants identified that the ERP system requires many steps to complete a process for performing a specific task. HEC (2016) and stakeholders could consider this limitation while expanding the ERP systems to other public sector universities in Pakistan. The research study respondents identified frequent training sessions to end-users as critical success factors for implementing the plan. The training session enhanced the motivational level of end-users to achieve the shared vision set by the institution. Overall, the results of present research findings supported the notion that the ERP system's post implementation data supports higher management in strategic decision-making processes that influence the organization's success. The successful implementation of ERP systems in the public sector universities considers as a competitive edge over the other universities in Pakistan. ERP systems' successful performance would save money and time and develop better communication between the universities and HEC in Pakistan.

6.5 Directions for Future Research

There is very little research reported in the literature in the selected domain in the Pakistani context. This research has provided some insights that could be used as a reference point to compare the current study's contributions and results in different contexts. The following are a few possible directions for future research to continue this research:

First, future researchers need to continue the research with different organizations where ERP's are implemented with other samples and methodologies. The present study could form the basis for a future longitudinal study in more institutions. Comparative research may be useful for higher education between institutions where ERP systems have been implemented and those where a legacy old manual system is used.

Second, in this research, my emphasis has been on the CMS module implemented in the first phase. The study could be extended to complete ERP systems with all modules (FCM, HCM and SCM) involving different stakeholders, such as administrative staff.

Third, future research should test the applicability of the proposed research model by taking a data sample from different public or private universities to check whether findings can be generalized in the context of a different environment. Fourth, the study recommends further research in this area to find other factors (variables) that impact ERP success in higher education. Besides, future research could use longitudinal data and random sampling to improve the generalizability of the results.

6.5.1 Potential Benefits of the Study for Future Research

The current research study has aided the development of the future research direction of ERP investment in Pakistan's public sector universities. The HEC emphasizes all the public sector universities to implement ERP to increase efficiency and transparency in academic, financial and administrative processes. Future IS researchers can benefit from the current research in the following areas:

(a) The current research provided a conceptual model to evaluate the post-impact of ERP in higher education, which was not available before this study was carried out.

(b) Identified and developed different contextual factors affecting ERP impact in higher education. These factors are relevant and should be considered by future researchers while developing a conceptual framework, as these will influence the outcome of their study.

(c) The IS researcher can get guidance from the survey tools and interview protocols designed for implementing the sequential mixed-methods approach.

6.6 Personal Reflection

The EdD journey has been a long and momentous task for me and has demanded a lot of commitment, effort and time. I have been doing a full-time job and working late hours to complete my EdD studies. I have received my family's continuous support because I have spent my social and family time on this journey. While going through this EdD process, I encountered many challenges, made adjustments, and persevered to complete the journey. I have selected the topic of my research during the final courses on the EdD journey. My topic for research from the start of this pursuit was ERP systems implementation in higher education in Pakistan, which is very close to my practice as Registrar. The study participants were students, faculty members, heads of department, and top management of the universities. Having experience with ERP systems implementation in higher education has facilitated my understanding of the process dynamics. I have selected my university and one other university in another city for the collection of data. I understood my biases and worked to minimize them throughout the data collection process. I gained a deeper understanding of strategic management requirements in a higher education institution's ERP system implementation. During the data collection process, I learned that higher education institutions experience some of the same issues as other industries and some different ones because of their unique characteristics. The possible effects on the participants are the realization of how resilient they are. During the ERP data collection process, it was challenging to get people motivated to invest their time in participating in an interview. Despite the issues and sometimes chaos, the participants were motivated and committed to the continuous improvement process. Completing this thesis is not the end of my journey; instead, it is the beginning of a new era in my teaching career. I intend to continue to publish this research in reputable research journals and continue to guide fresh researchers in this field. During the data collection process, techniques learned and experience gained will help me in future research supervision and publication in scholarly journals. New

Software tools such SPSS, PLS-SEM for quantitative data analysis and NVivo for qualitative data analysis were learned during the research findings.

6.7. Conclusion

The footprint of the ERP systems is growing in the private and public sector universities. HEC is emphasizing the public sector universities to implement the ERP systems to increase efficiency and transparency in different academic and administrative processes. The study could be further extended to other business organizations and government departments. This study used a modified version of the DeLone and McLean IS success model to test the hypotheses. The research study's findings were significant for the relationship among service quality, system quality, information quality, user satisfaction, perceived net benefits, and ERP success.

This means that the ERP system is beneficial for the HEIs to improve the academic processes, student feedback system and strategic decision making by higher management. It is hoped that the results of the research study may be used as a reference by higher education management to improve academic processes and strategic decision making. Nine themes emerged from the quantitative data analysis: *Teachers' Performance, Students' Performance, Courses Management, Better Communication, Academic Process and Performance, Teaching Methodology, Feedback Mechanism, ERP GUI Interfaces, and Strategic Planning and Decision-Making.* Hopefully, this research will inspire the other researchers working in the same field of study. The main intention of doing this research was to add to the body of knowledge around ERP implementation in higher education institutions and provide guidance to those interested in doing future research in the same domain. The universities require instant access to relevant and updated information to make strategic decisions related to operational matters, structure and culture. The successful ERP implementation will provide top-level university management at different levels with the required information for informed decision-making purpose.

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Appendices

Appendix A- Questionnaire- Students

Dear Students

Purpose of the Questionnaire

This questionnaire is one component of my research study called "The impact of Enterprise Resource Planning (ERP) in Higher Education Institutions: Support in improvement of academic processes". The main objective of this research is to evaluate the post implementation impact of ERP systems at the Higher Education Institutions (HEIs) in Pakistan to improve teaching & learning processes and the higher education leadership decision-making process. The study is important in the local context to help the HEC and other universities with the implementation and expansion of the ERP in other public sector universities of Pakistan. The online survey questionnaire may take 15 to 20 minutes to answer the questions.

What is the ERP/CMS?

The ERP system has several modules for handling the different functions in higher education institutions, such as CMS (Campus Management Solution). A CMS is an integrated solution that manages the entire student lifecycle from initial enrollment, student records, managing course, student financials, attendance, assessment, course evaluation, finally graduation and alumni relationships. CMS supports many functionalities of the teaching and learning processes. It also supports many alerts to students through a self-service module.

What will happen with the data? Confidentiality and Privacy

Participation in this study will be voluntary. As a participant in this research study you are free to withdraw from the research at any time. You are also free to choose not to answer particular questions. Your name and other personal details are not being collected to keep confidentiality. During data analysis all the university names will be removed to ensure confidentiality. The data that you will provide on this questionnaire will be stored securely on a password-protected computer and in a locked filling cabinet that only I as researcher have access to. The data will be used only in the form of statistical summaries. Your individual response will not be accessed by anyone other than me. All

questionnaire responses will be kept confidential and will be used only for this research study without disclosure of individual information.

Are there any risks in taking part?

There are no risks involved in taking part in the research study. Participant's interests will be safeguarded; no identity will be disclosed during the analysis of data and discussion of the research findings to ensure confidentiality. During the interview process, the researcher will try to keep the participants relaxed and comfortable. The interviews will be conducted at the University campus in a private pre-reserved discussion room to avoid any disturbance and safeguard confidentiality.

Are there any benefits in taking part?

The outcome of the research can provide data to develop future strategy to higher education management and university leadership regarding the challenges and opportunities for existing and further investment in of ERP systems. The outcome of the study will help provide guidelines for the future expansion of ERP Systems in different publicly funded universities of Pakistan through the Higher Education Commission.

Thank you very much for your participation in this research study. I appreciate your time and effort in participation in the research study. I would be happy to share the final report of the study with those participants who are interested. If you have any questions or concerns or if you need any further information, please feel free to contact me.

Thank you very much for your cooperation.

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Section-A
Demographic Information

1. Are you using the Campus Management Solution (CMS) System at the University?
   ( ) Yes ( ) No
2. Name of the University:
   [redacted].
3. Department:
   ( ) Business Administration ( ) Computer Science ( ) Electrical Engineering ( ) Mathematics ( ) Education ( ) Other
4. How long have you been using Enterprise Resource Planning (ERP) in your University?
   ( ) months ( ) Years
5. Gender:
   ( ) Male ( ) Female
6. Age:

   ( ) Less than 21 ( ) 21 and below 25 years
   ( ) 25 and below 30 years ( ) 30 and below 40 years
   ( ) 40 and below 45 years ( ) 45 and below 50 years
   ( ) 50 years and Above

7. Education: Please specify the highest qualification you have attained:
   ( ) Higher Secondary School Certificate (12 years of education)
   ( ) Undergraduate (16 years of education)
   ( ) Graduate MS/MPhil (18 years of education)
   ( ) Doctoral PhD
8. How often do you use the system:
   ( ) Once a day ( ) Several times a day
   ( ) Once in a week ( ) Several times in a week

Section-B
Please rate to what extent you agree or disagree with each statement below by CLICKING the most appropriate number of the scales provided. Please click **ONLY ONE** option for each statement given below.

1	2	3	4	5
Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

System Quality

Information quality is measured in terms of ease-of-use, functionality, reliability, flexibility, data quality, portability, etc.

1. The Campus Management Solution (CMS) System is easy to use.
2. The CMS is effective in providing instant access to information required.
3. The CMS System streamlines the best academic practices in the University.
4. The CMS supports me in completing my academic related tasks efficiently.
5. The CMS is effective in providing accurate information about student attendance and grades.
6. The CMS provides complete attendance automation by effectively sending SMS and Email alerts to students.

Information Quality

Information quality is measured in terms of accuracy, timeliness, completeness, relevance, and consistency.

7. The CMS system effectively provides me with relevant information.
8. The information required is easily accessible in the CMS system.
9. The CMS system is easy to learn.
10. The CMS user interface can easily be configured to my personal requirements.
11. I think that my data in the CMS is safe from unauthorized access.
12. The CMS effectively generates text and email alerts if someone tries to enter my account unauthorized.

Service Quality

Service quality is used to measures reliability, responsiveness, assurance, and empathy.

13. The CMS system provides reliable information.
14. The information in CMS is easily searchable.

15. The CMS provides a smooth flow of information regarding the academic calendar, assignments and announcements of results.

16. The CMS provides access to grades, attendance, fee status, exam schedule and announcements of results related to students.

Impact of ERP

17. The CMS improves the academic processes in the University.

18. The CMS system effectively combines the student data from different departments of the University.

19. The CMS provides me single login ID that improves the information integration between different systems of the University.

User Satisfaction:

20. The CMS helps in sharing the scholarship related data of students with potential donors.
21. The CMS helps me in getting updated information about my attendance and grades on regular basis.

22. The CMS gives students a chance to provide course evaluations in each semester.

23. The feedback given by students in the course evaluations has helped to improve classroom teaching.
24. The CMS/ERP self-service automates many processes related with students (visibility of semester results, course registration and financial matters).

25. I received adequate CMS related trainings during my studies to perform my academic tasks on system effectively.

26. It is easy to get required support from IT support team whenever required.

Net benefits

27. It is useful that the CMS manages classroom information and analytical reports of the student grades and attendance.

28. The CMS helps me to improve my academic performance by receiving SMS alerts on attendance and grades.

29. The CMS provides a chance to students to provide feedback on the courses offered in a semester.

30. The CMS improves the internal communication within the university (students, faculty and administration).

31. The CMS effectively provides chance to register or drop in different courses in a semester through self-service module as compared from what we had before.

32. The CMS provides a chance to students to provide feedback at the end of a semester about their overall experience regarding classroom teaching/learning for courses offered in a semester.

33. The CMS provides grades related information, which may help students to monitor their progress during the semester.

34. Are there any additional comments about your experiences with CMS/ERP.

Appendix B- Questionnaire- Faculty

Dear Faculty Members

Purpose of the Questionnaire

This questionnaire is one component of my research study called "The impact of Enterprise Resource Planning (ERP) in Higher Education Institutions: Support in improvement of academic processes". The main objective of this research is to evaluate the post implementation impact of ERP systems at the Higher Education Institutions (HEIs) in Pakistan in improving of teaching & learning processes and the higher education leadership decision-making process. The study is important in the local context to help the HEC and other universities with the implementation and expansion of the ERP in other public sector universities of Pakistan. The online survey questionnaire may take 15 to 20 minutes to answer the questions.

What is the ERP/CMS?

The ERP system has several modules for handling the different functions in higher education institutions, such as CMS (Campus Management Solution). A CMS is an integrated solution that manages the entire student lifecycle from initial enrollment, student records, managing course, student financials, attendance, assessment, course evaluation, finally graduation and alumni relationships. CMS supports many functionalities of the teaching and learning processes. It also supports many alerts to students through a self-service module.

What will happen with the data? Confidentiality and Privacy

Participation in this study is voluntary. As a participant in this research study you are free to withdraw from the research at any time. You are also free to choose not to answer particular questions. Your name and other personal details are not being collected to keep confidentiality. During data analysis all the university names will be removed to ensure confidentiality. The data that you will provide on this questionnaire will be stored securely on a password-protected computer and in a locked filling cabinet that only I as researcher have access to. The data will be used only in the form of statistical summaries. Your individual response will not be accessed by anyone other than me. All questionnaire responses will be kept confidential and will be used only for this research study without disclosure of individual information.

Are there any risks in taking part?

There are no risks involved in taking part in the research study. Participant's interests will be safeguarded; no identity will be disclosed during the analysis of data and discussion of the research findings to ensure confidentiality. During the interview process, the researcher will try to keep the participants relaxed and comfortable. The interviews will be conducted at the University campus in a private pre-reserved discussion room to avoid any disturbance and safeguard confidentiality.

Are there any benefits in taking part?

The outcome of the research can provide data to develop future strategy to higher education management and university leadership regarding the challenges and opportunities for existing and further investment in of ERP systems. The outcome of the study will help provide guidelines for the future expansion of ERP Systems in different publicly funded universities of Pakistan through the Higher Education Commission.

Thank you very much for your participation in this research study. I appreciate your time and effort in participation to the research study. I would be happy to share the final report of the study with those participants who are interested. If you have any question or concern or you need any further information, please feel free to contact me.

Thank you very much for your cooperation.

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Section-A

Demographic Information

1. Are you using the Campus Management Solution (CMS) System at the University?
   ( ) Yes ( ) No
2. Name of the University:
   [redacted].
3. Department:
   ( ) Business Administration ( ) Computer Science ( ) Electrical Engineering ( ) Mathematics ( ) Education ( ) Other
4. How long have you been using Enterprise Resource Planning (ERP) in your University?
   ( ) months ( ) Years
5. Gender:
   ( ) Male ( ) Female
6. Age:
   ( ) 21 and below 25 years ( ) 25 and below 30 years
   ( ) 30 and below 40 years ( ) 40 and below 45 years
   ( ) 45 and below 50 years ( ) 50 years and Above
7. Education: Please specify the highest qualification you have attained:
   ( ) Higher Secondary School Certificate (12 years of education)
   ( ) Undergraduate (16 years of education)
   ( ) Graduate MS/MPhil (18 years of education)
   ( ) Doctoral PhD
8. Type of User:
   ( ) Faculty Members ( ) Others
9. How often do you use the system:
   ( ) Once a day ( ) Several times a day
   ( ) Once in a week ( ) Several times in a week

Section-B

Please rate to what extent you agree or disagree with each statement below by TICKING the most appropriate number of the scales provided. Please click **ONLY ONE** option for each statement given below.

1	2	3	4	5
Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

System Quality

Information quality is measured in terms of ease-of-use, functionality, reliability, flexibility, data quality, portability, etc.

1. The Campus Management Solution (CMS) System is an improvement from what we had before.
2. The CMS system is effectively designed in providing instant access to information required.
3. The CMS System streamlines the best academic practices in the University.
4. The CMS helps me in completing my academic related tasks efficiently.
5. The CMS is effective in providing accurate information about student attendance and grades.
6. The CMS is effective in providing complete attendance automation by sending SMS and Email alerts to students.

Information Quality

Information quality is measured in terms of accuracy, timeliness, completeness, relevance, and consistency.

7. The CMS system provides me with accurate information in comparison to the manual system we used before.
8. The information required is easily accessible in the CMS system in comparison to the manual system we used before.
9. The CMS system is easy to learn.
10. The CMS user interface can easily be configured to my personal requirements.
11. I think that my data in the CMS is safe from unauthorized access.
12. The CMS generates text and email alerts if someone tries to enter my account unauthorized.

Service Quality

Service quality is used to measures reliability, responsiveness, assurance, and empathy.

13. The CMS system provides reliable information.
14. The information in CMS is easily searchable.

15. The CMS provides a smooth flow of information regarding the academic calendar, assignments and announcements of results.
16. The CMS effectively provides access to grades, attendance, fee status, exam schedule and announcements of results related to students.

Impact of ERP

17. The CMS has improved the academic processes in the University.
18. The CMS improves the student data integration between different departments of the University.
19. The CMS improves the information sharing between different departments (admission, finance, Library and examinations) of the University.

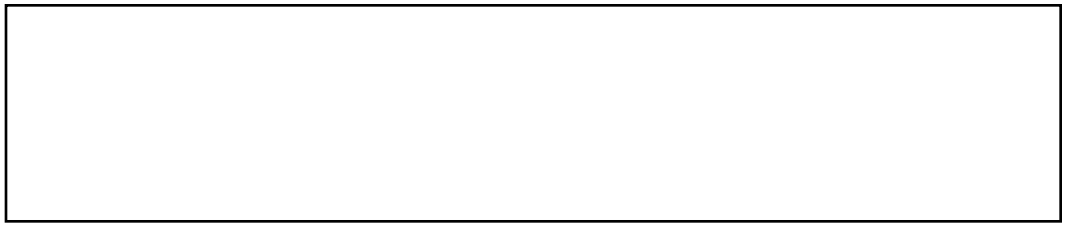
User Satisfaction:

20. The CMS helps in sharing the scholarship related data of students with potential donors.
21. The CMS helps the University to update the contact information about Alumni for job placement after graduation.
22. The CMS gives students a chance to provide course evaluations in each semester.
23. The feedback given by students in the course evaluations has improved my classroom teaching.
24. The feedback given by the students in course evaluations helps to identify weak areas in classroom teaching.
25. I receive adequate CMS related trainings to perform my academic tasks effectively.
26. It is easy to get required support from IT support team whenever required.

Net benefits

27. It is useful that the CMS manages classroom information and analytical reports of the student grades and attendance.

28. The CMS improves quality of interaction between faculty members and parents by sending them attendance and grades SMS alerts.
29. The CMS provides a chance to students with an effective way to provide feedback on the courses offered in a semester.
30. The CMS improves the internal communication within the university (students, faculty and administration).
31. The CMS provides useful reports about students, faculty members, programs and courses that can be shared.
32. The feedback given by the students helps me to improve my teaching methodology in upcoming semesters.
33. The feedback given by students is a true reflection of classroom teaching.
34. Are there any additional comments about your experiences with CMS/ERP.



Appendix C- Interview Protocol

INTERVIEW QUESTIONS

Interview questions from Faculty Members (Six interviews)

1. Describe your experience with the implementation of ERP. Has the ERP implementation enhanced the academic related processes such as the feedback received from the students at the end of semester on the teaching methodology and assessment?
2. Did the student course evaluations have any effect on your teaching methodology? Please explain.
3. What challenges, if any, have you faced in end of course evaluation surveys filled out by the students at the end of the semester? Please explain.
    a. Do you think the survey result is a true reflection of your classroom teaching?
    b. If not what other factors would you suggest for inclusion in the surveys?
4. What challenges if any have you faced while using the ERP system in academic processes?
5. Has ERP improved or hindered communication between different departments? Please explain.
6. In your opinion, has ERP improved or hindered the academic processes? Please explain how.
7. How much support and training have you received after the implementation of ERP in the University? What additional training would have helped the smooth implementation?
8. What suggestions can you give to help the effective use of ERP in the improvement of academic processes?

Interview questions from Vice Chancellor/Director (Two interviews)

1. Describe how the ERP implementation is aligned with the mission and vision of the University/Institute?
    a. Is it aligned with Goals & Objectives of the University/Institute?
    b. The academic processes are aligned with mission of the University. Please explain.
2. Describe how the ERP implementation was expected to support the enhancement of the academic processes.
3. Can you now tell what in your view, were the actual outcomes of the ERP implementation for the enhancement of the academic processes.
4. Have you noticed any improvement in classroom teaching by the faculty members? And if so how do you obtain this information.
5. Describe your experience of the use of ERP in your decision-making processes.

6. Does the ERP is supposed to provide you with the data required to support decision making processes.
    a. How was your experience with this?
    b. Was it easy to get access to the data?
    c. Do you think that the availability of this data can lead to the improvement of academic processes?
7. Describe if communication has been improved or hindered between different stakeholders and departments though ERP?
8. In your opinion, was the feedback given by the students in ERP for course evaluation useful in your academic decision-making?
9. Do you have a standard for the minimum level of feedback given by students to action on it? What measures are taken if the feedback given by the students is below a certain level?
10. What challenges, if any do you see in the future after the implementation of ERP and how do you plan to mitigate these challenges?

Interview questions from Dean's/HoD's (Four interviews)

1. Describe how the ERP implementation is aligned with the mission and vision of the Academic Department/Faculty/School?
2. In your opinion, has the ERP implementation enhanced or hindered the academic related processes? For instance the feedback received from the students at the end of semester on teaching methodology and grades. Please explain.
3. Have you observed any improvement in classroom teaching after the implementation of ERP in the University? Please explain.
4. If at all, please describe how ERP helped you in your decision-making processes.
5. Has the data collected helped in any way?
6. In your view, has communication between different stakeholders and departments been improved or hindered by the ERP implementation? Please explain.
7. In your view, has the feedback given by the students in ERP for course evaluation been useful in your decision-making? Please explain?
8. How do you communicate and discuss feedback given in the student course evaluations with faculty members?
9. Would regular reports on student feedback about individual course/members of faculty/programs be useful?
10. Do you have a standard for the minimum level of feedback given by students to action on it? What measures are taken if the feedback given by the students is below a certain benchmark set by the University?
11. What challenges, do you face in communicating the feedback with faculty members during course allocation for next semester and performance evaluation?

Appendix D- Participant Consent Form

Committee on Research Ethics

PARTICIPANT CONSENT FORM

Title of Research Project:	**The Impact of Enterprise Resource Planning (ERP) in Higher Education Institutions.** Support in improvement of academic processes
Researcher(s):	Zahid Hussain Khand

Please initial box

1. I confirm that I have read and have understood the information sheet dated --- January, 2018 for the above study. I have had the opportunity to consider the information, ask questions and have had these answered satisfactorily. ☐
2. I understand that my participation is voluntary and that I am free to withdraw at any time without giving any reason, without my rights being affected. In addition, should I not wish to answer any particular question or questions, I am free to decline. ☐
3. I understand that, under the Data Protection Act, I can at any time ask for access to the information I provide and I can also request the destruction of that information if I wish. ☐
4. I agree to take part in the above study. ☐

Participant Name	Date	Signature
Zahid Hussain Khand Name of Person taking consent	Date	Signature
Zahid Hussain Khand Researcher	Date	Signature

Principal Investigator: **Student Researcher:**

Name Zahid Hussain Khand
Work Address Sukkur IBA University
Work Telephone 0092715644105
Work Email zahid@iba-suk.edu.pk

Appendix E- Ethical Approvals

[redacted]

Date: 9th January, 2018

STATEMENT OF ETHICAL APPROVAL*

Proposer: Zahid Hussain Khand

Title: The Impact of Enterprise Resource Planning (ERP) in Higher Education Institutions. Support in improvement of academic processes

The competent authority, [redacted] has been pleased to grant ethical approval to the research proposal submitted by Mr. Zahid Hussain Khand, EdD Scholar at University of Liverpool, UK. The approval is granted on the understanding that researcher will share questionnaire/tool and share the outcome of the results before publishing.

Regards,

IMRAN BATADA
Director ICT

Imran Batada
Director - ICT & CICT
[redacted]

[redacted]

No: [redacted] /62/17 Date 28 - 12 - 2017

STATEMENT OF ETHICAL APPROVAL

Proposer: Zahid Hussain Khand

Title: The Impact of Enterprise Resource Planning (ERP) in Higher Education Institutions. Support in improvement of academic processes

The 1st meeting of the [redacted] Ethical Review Board was held on November 24, 2017. The committee reviewed the research proposal submitted by Mr. Zahid Hussain Khand, EdD Scholar at University of Liverpool, UK. The Ethical Review Board concluded that *the proposed research does not carry any ethical issues*. However the researcher is required to ensure the following:

a. Share the subsequent changes in research questionnaire/tool made after November 24, 2017 with the board.
b. Keep the convener of ethical review board in loop while communicating the target respondents.
c. Since the researcher is also registrar [redacted], so in order to avoid the use of administrative authority the target respondents may be sent only one reminder after the formal request.

Prof. Dr. Pervaiz Ahmed Memon
Convener, Ethical Review Board

Director
Office of Research,
Innovation & Commercialization-oric

[redacted]

Appendix F- Virtual Programme Research Ethics Committee (VPREC) Approval

UNIVERSITY OF LIVERPOOL | ONLINE PROGRAMMES

Dear Zahid Khand

I am pleased to inform you that the EdD. Virtual Programme Research Ethics Committee (VPREC) has approved your application for ethical approval for your study. Details and conditions of the approval can be found below.

Sub-Committee:	EdD. Virtual Programme Research Ethics Committee (VPREC)
Review type:	Expedited
PI:	
School:	Lifelong Learning
Title:	The Impact of Enterprise Resource Planning (ERP) in Higher Education Institutions. Support in improvement of academic processes
First Reviewer:	Dr. Morag A. Gray
Second Reviewer:	Dr. Mariya Yukhymenko
Other members of the Committee	Drs. Josè Reis Jorge, Greg Hickman, Ellen Boeren, Yota Dimitriadi, Lucilla Crosta and Kalman Winston .....
Date of Approval:	14th February 2018

The application was APPROVED subject to the following conditions:

Conditions		
1	Mandatory	M: All serious adverse events must be reported to the VPREC within 24 hours of their occurrence, via the EdD Thesis Primary Supervisor.

This approval applies for the duration of the research. If it is proposed to extend the duration of the study as specified in the application form, the Sub-Committee should be notified. If it is proposed to make an amendment to the research, you should notify the Sub-Committee by following the Notice of Amendment procedure outlined at http://www.liv.ac.uk/media/livacuk/researchethics/notice%20of%20amendment.doc.

Where your research includes elements that are not conducted in the UK, approval to proceed is further conditional upon a thorough risk assessment of the site and local permission to carry out the research, including, where such a body exists, local research ethics committee approval. No documentation of local permission is required (a) if the researcher will simply be asking organizations to distribute research invitations on the researcher's behalf, or (b) if the researcher is using only public means to identify/contact participants. When medical, educational, or business records are analysed or used to identify potential research participants, the site needs to explicitly approve access to data for research purposes (even if the researcher normally has access to that data to perform his or her job).

Please note that the approval to proceed depends also on research proposal approval.

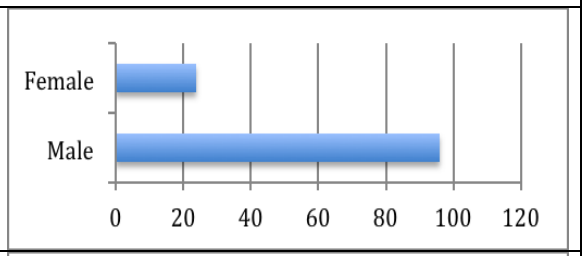
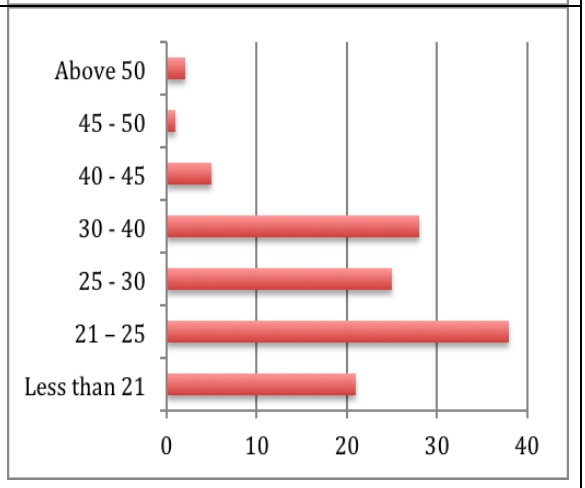
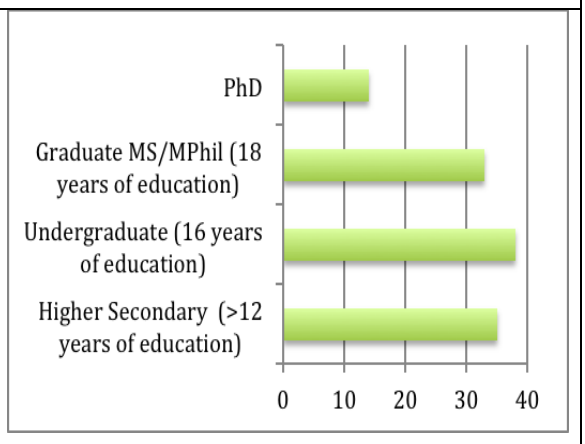
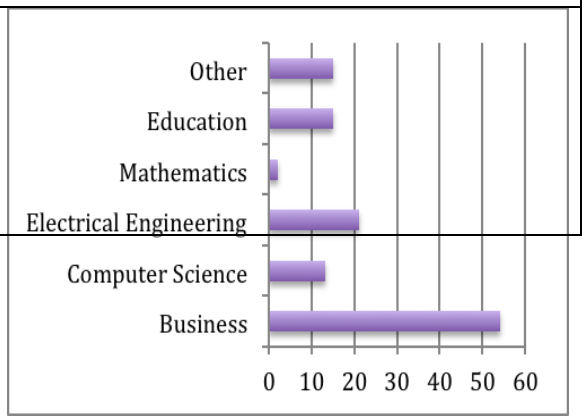
Kind regards,

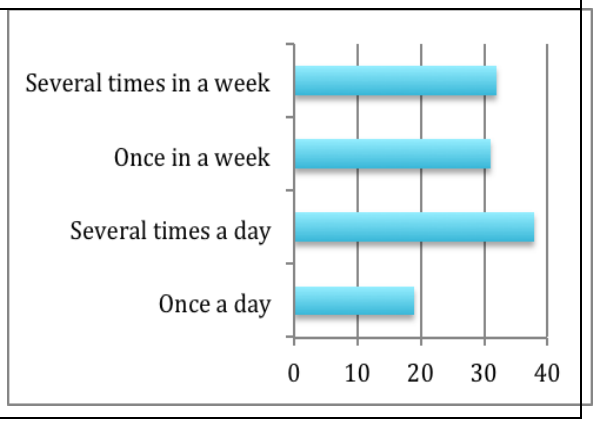
Lucilla Crosta, Chair, EdD. VPREC

Appendix G- Descriptive Statistics

Demographic Profile of Respondents (Students)

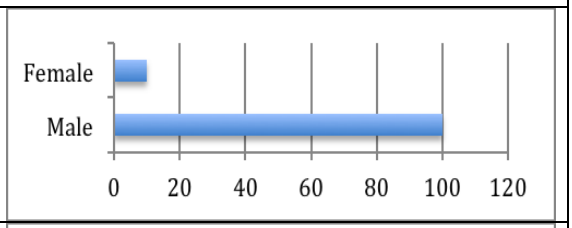
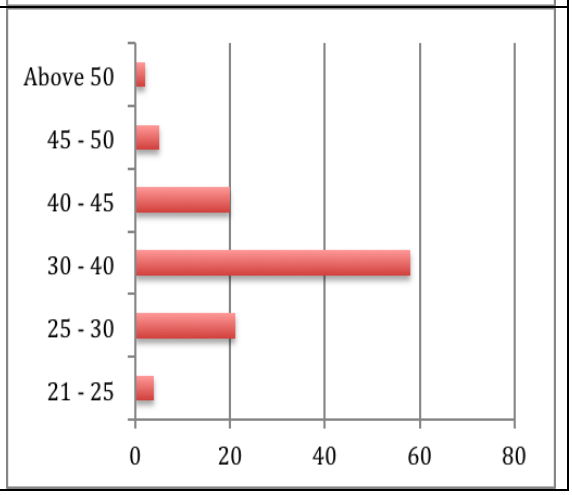
Demographic information about the respondents

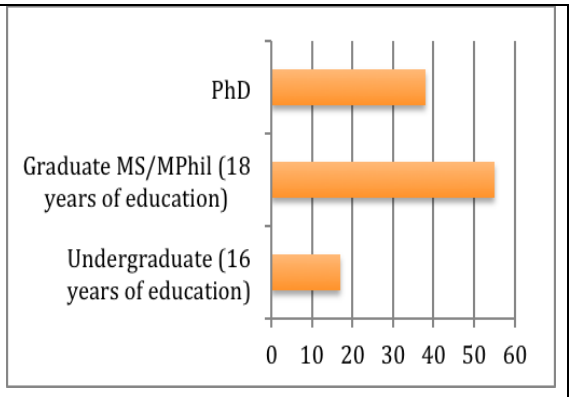
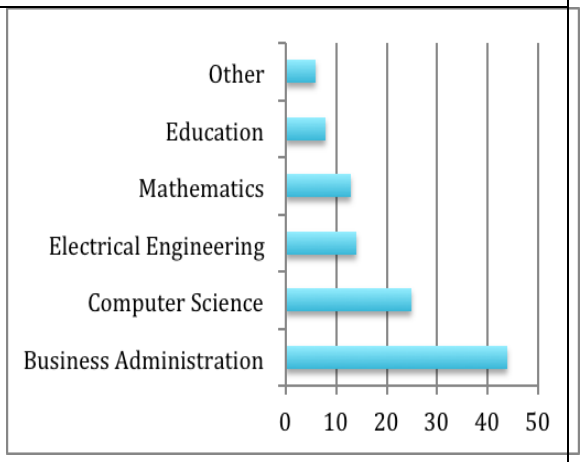
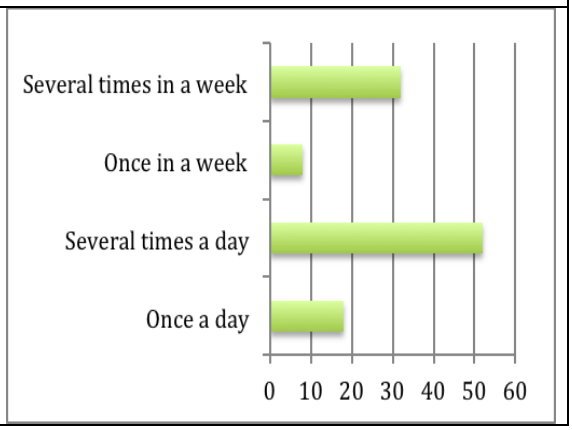
Variables	Categories	Frequency	Percentage (%)	
Gender	Male	96	80.0	
	Female	24	20.0	
Age	Less than 21	21	17.5	
	21 – 25	38	31.7	
	25 - 30	25	20.8	
	30 - 40	28	23.3	
	40 - 45	5	4.2	
	45 - 50	1	0.8	
	Above 50	2	1.7	
Education	Higher Secondary (12 years of education)	35	29.2	
	Undergraduate (16 years of education)	38	31.7	
	Graduate MS/MPhil (18 years of education)	33	27.5	
	PhD	14	11.7	
Department	Business Administration	54	45.0	
	Computer Science	13	10.8	
	Electrical	21	17.5	

	Engineering			
	Mathematics	2	1.7	
	Education	15	12.5	
	Other	15	12.5	
Use of ERP System	Once a day	19	15.8	
	Several times a day	38	31.7	
	Once in a week	31	25.8	
	Several times in a week	32	26.7	

Demographic Profile of Respondents (Faculty)

Demographic information about the respondents

Variables	**Categories**	**Frequency**	**Percentage (%)**	
Gender	Male	100	90.9	
	Female	10	9.1	
Age	21 - 25	4	3.6	
	25 - 30	21	19.1	
	30 - 40	58	52.7	
	40 - 45	20	18.2	
	45 - 50	5	4.5	
	Above 50	2	1.8	
Educat				

ion	Undergraduate (16 years of education)	17	15.5	
	Graduate MS/MPhil (18 years of education)	55	50.0	
	PhD	38	34.5	
Department	Business Administration	44	40.0	
	Computer Science	25	22.7	
	Electrical Engineering	14	12.7	
	Mathematics	13	11.8	
	Education	8	7.3	
	Other	6	5.5	
Use of ERP System	Once a day	18	16.4	
	Several times a day	52	47.3	
	Once in a week	8	7.3	
	Several times in a week	32	29.1	

Descriptive Statistics for Student Responses

Descriptive Statistics-Students					
	N	Min	Max	Mean	Std. Deviation
The Campus Management Solution (CMS) System is easy to use	120	2	5	4.1917	0.73674
The CMS is effective in providing instant access to information required	120	2	5	4.2417	0.69809
The CMS System streamlines the best academic practices in the University	120	1	5	4.1083	0.7864
The CMS supports me in completing my academic related tasks efficiently	120	1	5	3.7833	0.8905
The CMS is effective in providing accurate information about student attendance and grades	120	2	5	4.575	0.5893
The CMS provides complete attendance automation by effectively sending SMS and Email alerts to students	120	1	5	3.9333	1.20037
The CMS system effectively provides me with relevant information	120	2	5	4.1583	0.71002
The information required is easily accessible in the CMS system	120	2	5	4.1167	0.80108
The CMS system is easy to learn	120	1	5	3.975	0.88368
The CMS user interface can easily be configured to my personal requirements	120	1	5	3.5417	1.00332
I think that my data in the CMS is safe from unauthorized access	120	1	5	4.0333	0.87863
The CMS effectively generates text and email alerts if someone tries to enter my account unauthorized	120	1	5	3.425	1.17153
The CMS system provides reliable information	120	2	5	4.2167	0.62421
The information in CMS is easily searchable	120	1	5	3.875	0.86542
The CMS provides a smooth flow of information regarding the academic calendar, assignments and announcements of results	120	1	5	3.7667	1.00196
The CMS provides access to grades, attendance, fee status, exam schedule and announcements of results related to students	120	1	5	3.9833	0.99565
The CMS improves the academic processes in the University	120	2	5	4.3583	0.67108
The CMS system effectively combines the student data from different departments of the University	120	1	5	4.0333	0.8395
The CMS provides me single login ID that improves the information integration between different systems of the University	120	2	5	4.2333	0.69492
The CMS helps in sharing the scholarship related data of students with potential donors.	120	1	5	3.0833	1.09685
The CMS helps me in getting updated information about my attendance and grades on regular basis	120	2	5	4.275	0.69769
The CMS gives students a chance to provide course evaluations in each semester	120	2	5	4.4583	0.65972
The feedback given by students in the course evaluations has helped to improve classroom teaching	120	1	5	3.6417	1.22848

The CMS/ERP self-service automates many processes related with students(visibility of semester results, course registration and financial matters)	120	2	5	4.0917	0.69809
I received adequate CMS related trainings during my studies to perform my academic tasks on system effectively	120	1	5	3.2917	1.07996
It is easy to get required support from IT support team whenever required	120	2	5	4.0917	0.81988
It is useful that the CMS manages classroom information and analytical reports of the student grades and attendance	120	2	5	4.1083	0.67108
The CMS helps me to improve my academic performance by receiving SMS alerts on attendance and grades	120	1	5	3.6667	1.19053
The CMS provides a chance to students to provide feedback on the courses offered in a semester	120	1	5	4.1167	0.92748
The CMS improves the internal communication within the university (students, faculty and administration)	120	1	5	3.725	1.02048
The CMS effectively provides chance to register or drop in different courses in a semester through self-service module as compared from what we had before	120	2	5	4.05	0.85847
The CMS provides a chance to students to provide feedback at the end of a semester about their overall experience regarding classroom teaching/learning for courses offered in a semester	120	1	5	4.0833	0.90362
The CMS provides grades related information, which may help students to monitor their progress during the semester	120	2	5	4.3167	0.59385

Descriptive Statistics for Faculty Responses

Descriptive Statistics – Faculty					
	N	Min	Max	Mean	Std. Deviation
The Campus Management Solution (CMS) System is an improvement from what we had before	110	2.00	5.00	4.3909	.65098
The CMS system is effectively designed in providing instant access to information required	110	1.00	5.00	4.0636	.80454
The CMS System streamlines the best academic practices in the University.	110	2.00	5.00	4.0364	.86658
The CMS helps me in completing my academic related tasks efficiently	110	2.00	5.00	3.9455	.82213
The CMS is effective in providing accurate information about student attendance and grades	110	2.00	5.00	4.4727	.73832
The CMS is effective in providing complete attendance automation by sending SMS and Email alerts to students	110	1.00	5.00	4.2000	.89648
The CMS system provides me with accurate information in comparison to the manual system we used before	110	2.00	5.00	4.3818	.66335
The information required is easily accessible in the CMS system in comparison to the manual system we used before	110	2.00	5.00	4.2273	.83126
The CMS system is easy to learn	110	1.00	5.00	3.6727	1.01465
The CMS user interface can easily be configured to my personal requirements	110	1.00	5.00	3.2636	1.10609
I think that my data in the CMS is safe from unauthorized access	110	1.00	5.00	3.7818	.91252
The CMS generates text and email alerts if someone tries to enter my account unauthorized	110	1.00	5.00	3.8182	1.07671
The CMS system provides reliable information	110	2.00	5.00	4.1818	.65219
The information in CMS is easily searchable	110	1.00	5.00	3.7455	.94273
The CMS provides a smooth flow of information regarding the academic calendar, assignments and announcements of results	110	1.00	5.00	3.6545	.94273
The CMS effectively provides access to grades, attendance, fee status, exam schedule and announcements of results related to students	110	2.00	5.00	3.8727	.95887
The CMS has improved the academic processes in the University	110	2.00	5.00	4.1818	.74417

The CMS improves the student data integration between different departments of the University	110	2.00	5.00	3.9636	.92793
The CMS improves the information sharing between different departments (admission, finance, Library and examinations) of the University	110	1.00	5.00	3.9364	.96998
The CMS helps in sharing the scholarship related data of students with potential donors	110	1.00	5.00	3.2545	.91307
The CMS helps the University to update the contact information about Alumni for job placement after graduation	110	1.00	5.00	3.2727	.97594
The CMS gives students a chance to provide course evaluations in each semester	110	1.00	5.00	4.2909	.80532
The feedback given by students in the course evaluations has improved my classroom teaching	110	1.00	5.00	3.9273	.96459
The feedback given by the students in course evaluations helps to identify weak areas in classroom teaching	110	1.00	5.00	3.9818	.84573
I receive adequate CMS related trainings to perform my academic tasks effectively	110	1.00	5.00	3.3818	1.03145
It is easy to get required support from IT support team whenever required	110	2.00	5.00	3.9636	.89778
It is useful that the CMS manages classroom information and analytical reports of the student grades and attendance	110	2.00	5.00	4.1000	.64892
The CMS improves quality of interaction between faculty members and parents by sending them attendance and grades SMS alerts	110	1.00	5.00	3.5091	1.02039
The CMS provides a chance to students with an effective way to provide feedback on the courses offered in a semester	110	1.00	5.00	3.9273	.77470
The CMS improves the internal communication within the university (students, faculty and administration)	110	1.00	5.00	3.6909	.96494
The CMS provides useful reports about students, faculty members, programs and courses that can be shared	110	1.00	5.00	3.8182	.84790
The feedback given by the students helps me to improve my teaching methodology in upcoming semesters	110	1.00	5.00	3.9273	.86427

The feedback given by students is a true reflection of classroom teaching	110	1.00	5.00	3.2364	1.02203

Descriptive Statistics for Combined Responses

Descriptive Statistics – Combined					
	N	Min	Max	Mean	Std. Deviation
The Campus Management Solution (CMS) System is an improvement from what we had before	230	2.00	5.00	4.2870	.70265
The CMS system is effectively designed in providing instant access to information required	230	1.00	5.00	4.1565	.75451
The CMS System streamlines the best academic practices in the University.	230	1.00	5.00	4.0739	.82468
The CMS helps me in completing my academic related tasks efficiently	230	1.00	5.00	3.8609	.86046
The CMS is effective in providing accurate information about student attendance and grades	230	2.00	5.00	4.5261	.66524
The CMS is effective in providing complete attendance automation by sending SMS and Email alerts to students	230	1.00	5.00	4.0609	1.07197
The CMS system provides me with accurate information in comparison to the manual system we used before	230	2.00	5.00	4.2652	.69566
The information required is easily accessible in the CMS system in comparison to the manual system we used before	230	2.00	5.00	4.1696	.81575
The CMS system is easy to learn	230	1.00	5.00	3.8304	.95850
The CMS user interface can easily be configured to my personal requirements	230	1.00	5.00	3.4087	1.06057
I think that my data in the CMS is safe from unauthorized access	230	1.00	5.00	3.9130	.90187
The CMS generates text and email alerts if someone tries to enter my account unauthorized	230	1.00	5.00	3.6130	1.14182
The CMS system provides reliable information	230	2.00	5.00	4.2000	.63658
The information in CMS is easily searchable	230	1.00	5.00	3.8130	.90356
The CMS provides a smooth flow of information regarding the academic calendar, assignments and announcements of results	230	1.00	5.00	3.7130	.97358

The CMS effectively provides access to grades, attendance, fee status, exam schedule and announcements of results related to students	230	1.00	5.00	3.9304	.97767
The CMS has improved the academic processes in the University	230	2.00	5.00	4.2739	.71094
The CMS improves the student data integration between different departments of the University	230	1.00	5.00	4.0000	.88164
The CMS improves the information sharing between different departments (admission, finance, Library and examinations) of the University	230	1.00	5.00	4.0913	.84905
The CMS helps in sharing the scholarship related data of students with potential donors	230	1.00	5.00	3.1652	1.01457
The CMS helps the University to update the contact information about Alumni for job placement after graduation	230	1.00	5.00	3.7957	.97881
The CMS gives students a chance to provide course evaluations in each semester	230	1.00	5.00	4.3783	.73613
The feedback given by students in the course evaluations has improved my classroom teaching	230	1.00	5.00	3.7783	1.11694
The feedback given by the students in course evaluations helps to identify weak areas in classroom teaching	230	1.00	5.00	4.0391	.77247
I receive adequate CMS related trainings to perform my academic tasks effectively	230	1.00	5.00	3.3348	1.05570
It is easy to get required support from IT support team whenever required	230	2.00	5.00	4.0304	.85852
It is useful that the CMS manages classroom information and analytical reports of the student grades and attendance	230	2.00	5.00	4.1043	.65915
The CMS improves quality of interaction between faculty members and parents by sending them attendance and grades SMS alerts	230	1.00	5.00	3.5913	1.11281
The CMS provides a chance to students with an effective way to provide feedback on the courses offered in a semester	230	1.00	5.00	4.0261	.86121

The CMS improves the internal communication within the university (students, faculty and administration)	230	1.00	5.00	3.7087	.99229
The CMS provides useful reports about students, faculty members, programs and courses that can be shared	230	1.00	5.00	3.9391	.85944
The feedback given by the students helps me to improve my teaching methodology in upcoming semesters	230	1.00	5.00	4.0087	.88654
The feedback given by students is a true reflection of classroom teaching	230	1.00	5.00	3.8000	.98637