Usage of Enterprise Resource Planning Systems in Higher Education Institutions in Pakistan

A Thesis Submitted to the University of Hertfordshire in Partial Fulfilment of the Requirements for the Degree of Doctor of Philosophy

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Abstract

The purpose of this empirical study is to examine the usage of Enterprise Resource Planning Systems (ERPS) in Higher Education Institutes (HEIs). Recently, rapid growth in information technology services compels developing countries to emerge as an information-based society. This emergence corresponds with the calls of researchers to address ERPS (Abbas, 2011). However, there is a scarcity of efforts by researchers to identify the factors contributing to the usage of ERPS at the organisational, departmental and end-user layer in HEIs. To fill this gap, this research develops a Multi-Layer Usage Model (MLUM) to determine the factors of ERPS usage across the organisational, departmental and individual levels of HEIs. The theoretical foundation of this study is adapted from unified theory of acceptance and use of technology developed by Venkatesh et al (2003). The study is unique in many respects. Firstly, it offers a newly developed multi-level conceptual model that is tested empirically using three distinct questionnaires; one for each layer. A large primary dataset, 1317 responses, is collected through three questionnaire from 18 higher education institutions in Pakistan; 86 responses from the organisational layer, 143 from the departmental layer and 1088 from the end-user layer. Structural equation modelling is used to analyse the effect of factors at three layers contributing to the usage of ERPS. Furthermore, the models are refined by applying extensions of structural equation modelling. Results suggest that at the organisational layer human resource availability, tolerance for risks and conflicts, collegial support and collaboration and decision making and control are significant and contributed towards ERPS usage while at the end-user layer behavioural intentions and motivation were insignificant and were therefore, removed from the model. This study contributes to theory development regarding usage of innovations in the under-researched context of HEIs. It also provides indigenous manifestations of ERPS usage that may be used by policy-makers.

Keywords:

Enterprise Resource Planning Systems; Information Systems; Technology Usage; Structural Equation Modelling; Higher Education Institutions; Pakistan; Unified Theory of Acceptance and Use of Technology

Dedication

I dedicate this thesis to My Dear Family and My Valued Friends. Without their support, this accomplishment would have remained a dream.

THANK YOU.

Conference

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List of Abbreviations

CMS:	Campus Management System
CSV:	Comma Separated Values
DOI:	Diffusion of Innovation
ERP:	Enterprise Resource Planning
ERPS:	Enterprise Resource Planning Systems
HEC:	Higher Education Commission
HEI:	Higher Education Institution
HEIs:	Higher Education Institutions
HES:	Higher Education Sector
IS:	Information System
IT:	Information Technology
MLUM:	Multi-Layer Usage Model
Q-Org:	Questionnaire-Organisational Layer
Q-Dep:	Questionnaire-Departmental Layer
Q-Eu:	Questionnaire-End-user Layer
RQ:	Research Question
SEM:	Structural Equation Modelling
SIA:	System of Innovation Approach
TAM:	Technology Acceptance Model
TRA:	Theory of Reasoned Action
UTAUT:	Unified Theory of Acceptance and Use of Technology

Chapter 1. Introduction

1.1 Introduction

Enterprise Resource Planning Systems (ERPS) were introduced in the 1970s and were initially used as manufacturing resource planning systems. Since then, ERPS have undergone several improvements and are now established as the main controlling software for organisational data and processes (Rabaa'i, 2009). This software integrates and handle organisation wide data to manage all functions of the organisation. ERPS are business management automated systems to handle all distinct business processes of an organisation (Ross, 2007). They combine data from all functional areas of the organisation into one real-time database to disseminate useful information effectively and efficiently (Fowler and Gilfillan, 2003, Schlichter and Kraemmergaard, 2010).

The enterprise resource planning revolution resulted in the adoption of ERPS by the vast majority of Fortune 500 companies (Ross and Vitale, 2000, Scott and Wagner, 2003). However, more recently, Higher Education Institutions (HEIs) have been increasingly opting for ERPS to gain competitive advantage, to reduce operational costs and to enhance tasks effectiveness. Higher education sector (HES) has adopted ERPS in many countries across the world; United States of America (King et al., 2002), Australia (Nielsen, 2002, Fisher, 2006, Rabaa'i et al., 2009, Abugabah and Sanzogni, 2010), United Kingdom (Pollock and Cornford, 2004), Belgium, France and Switzerland (Charlier et al., 2004), Slovenia (Zornada and Velkavrh, 2005), Columbia (Graham, 2009), Pakistan (HEC Pakistan, 2009), Jordan (Abu-Shanab and Saleh, 2014) and ERPS have recorded significant growth in Higher Education sector (Waring and Skoumpopoulou, 2012).

A realm of research has been conducted on the implementation of innovation, and some studies have focused on innovation in Information System (IS). However, a major criticism of IS research is that most of it has focused mainly on the technical issues, and has ignored the dynamics of organisational players. The involvement of stakeholders and the specific characteristics of the organisation and its context are vital in the debate as both play an important role that can lead to success or failure of IS in any organisation. Literature suggests that ERPS studies are mainly conducted on adoption or implementation of the system with a focus on corporate sector (King et al., 1994, Shanks, 2000, Frambach and Schillewaert, 2002, Wejnert, 2002, Boudreau, 2003, Scott and Wagner, 2003, Thavapragasam, 2003, Baskaran and Muchie, 2006, Thatcher et al., 2006, Kshetri, 2007, Chou and Chang, 2008, Cui et al., 2008, Ke and Wei, 2008, Schubert and Williams, 2009b, Abu-Shanab and Saleh, 2014). Whereas, an important aspect, the usage of ERPS has gained little attention. Furthermore, There are few studies that focus on adoption or implementation of ERPS in higher education sector in general but they have not explored the concept of its usage (King et al., 2002, Nielsen, 2002, Charlier et al., 2004, Pollock and Cornford, 2004, Fisher, 2006, Graham, 2009, Waring and Skoumpopoulou, 2012). With reference to Pakistan, the degree of information system research is even smaller as compared to the developed countries (Rajapakse and Seddon, 2005, Zornada and Velkavrh, 2005, Udo et al., 2008, Anjum et al., 2015).

As inferred from literature, usage is a distinct and separate concept from adoption or implementation. While adoption or implementation are conceptualised as one-time events, usage is the continued employment of information system in an organisation. Therefore, there is an evident and clear research gap in addressing and exploring this phenomenon with respect to ERPS.

As already stated, the literature reveals that research on information system has mainly focused on technical issues as factors affecting the adoption of these systems, whereas the influence of dynamics of organisational players has not been much reported. This study also aims to evaluate the effect of various elements from the organisation that contribute towards the usage. Moreover, research on organisational players has focused on factors from only one level of the organisation, i.e. top management, departmental level or end-user layer. The research on one level of the organisation is not suitable as it does not give a clear picture of the problem. It is important to take up a study that addresses multiple levels of the same organisation in order to get the deeper understanding in the context. It is also very important to identify the factors, separately for each layer, affecting technology usage. This is the objective of the study to explore the factors affecting usage of ERPS at three layers of higher education institutions. To achieve this, the current study develops a framework that validates the dynamics at all three layers, i.e. top management, departmental and end-user; by identifying factors contributing to the usage of ERPS on each layer separately and then combining three layers to measure overall usage of ERPS in higher education institutions.

As HEIs are unable to gain much focus of active researchers, particularly with regards to the usage of ERPS, indicating there is a clear research gap on the usage of ERPS in HEIs. This research gap prevails globally as well as in Pakistan. This study addresses this gap by conducting a comprehensive literature review, developing a multi-layer conceptual framework and research methodology to explore the usage of ERPS in HEIs. It has also identified the factors contributing to the usage of ERPS at organisational, departmental and end-user layers.

1.2 Research problem

ERPS have been widely used in the corporate sector for decades but more recently higher education institutions have also implemented ERPS. There are various studies focusing on adoption and implementation of ERPS but few have focused on usage of ERPS. Similarly, the corporate sector has gained most of the attention of majority researchers as compared to the higher education sector. This research has aimed to identify the factors contributing to the usage of ERPS in HEIs. For the purpose, the factors contributing to ERPS usage are identified on three distinct layers; the organisational layer having top management officials involved in policy making, the departmental layer consisting of departmental heads supervising end-users and the end-user layer where the respondents are the end-users of the ERPS.

1.3 Research gap

The predominant focus of ERPS literature remained on the implementation process while only a few have paid attention to the usage of ERPS. Also, the majority of the ERPS studies are based in western context (King et al., 2002, Charlier et al., 2004, Nielsen, 2002, Fisher, 2006, Rabaa'i et al., 2009, Abugabah and Sanzogni,

2010) or have focused on the corporate sector to evaluate assimilation of ERPS in various operational functions (Bradford and Florin, 2003, Ke and Wei, 2008, Wang et al., 2008, AlGhamdi et al., 2013).

The research on ERPS usage has received the limited attention of researchers to date. As discussed in the introduction, the studies in the field focused majorly on ERPS adoption or implementation in corporate sector while usage of ERPS is deprived of the researchers' attention especially in higher education sector. Globally, the studies have discussed ERPS implementation in higher education sector (King et al., 2002, Nielsen, 2002, Charlier et al., 2004, Pollock and Cornford, 2004, Fisher, 2006, Graham, 2009, Waring and Skoumpopoulou, 2012) while in Pakistani context, the number of studies conducted is even lower than the developed countries (Rajapakse and Seddon, 2005, Zornada and Velkavrh, 2005, Udo et al., 2008, Khan et al., 2010, Anjum et al., 2015); as one study examining usage of ERPS in telecommunication sector (Kanwal and Manarvi, 2010), another study on cross-examination of ERPS usage across various industries of Pakistan (Shad et al., 2012) and examination of ERPS implementation in health care sector (Anjum et al., 2015). To the best of the knowledge, no study has addressed the issue of identifying factors contributing to ERPS usage in HEIs with a multi-level perspective. This identifies a clear research gap and the current study has focused on filling this. This study has concentrated on the development of a conceptual model that has identified the factors contributing to ERPS usage at three distinct layers of higher education institutions; organisational, departmental and end-user.

1.4 Research aims and objectives

Regardless of the rising implementation of ERPS, empirical research on its usage is missing. The aim of the research is to examine the usage of ERPS in HEIs. The objective is to identify factors contributing to multi-levels of ERPS usage in HEIs. Multi-level empirical research in this domain is a requirement for the continued evolution of theoretical underpinnings in information system research.

1.4.1 Research objectives

The primary objective of the study is to identify the factors contributing to the usage of ERPS at the organisational layer, departmental layer and end-user layer in HEIs in Pakistan. An additional objective of the research is to measure the overall usage of ERPS in HEIs.

1.4.2 Research questions

The aim of this study is to examine the usage of ERPS in HEIs. This is the first study of its kind that is addressing factors affecting ERPS usage at three distinct layers of higher education institutions. Also, determining the relevant effects on each layer is not taken up in literature. The primary objective of the study is to identify the factors contributing to the usage of ERPS at the organisational layer, the departmental layer and the end-user layer in HEIs. Also, the objective is to observe the overall usage of ERPS in HEIs. The research questions are given below:

RQ1: Which factors contribute to the ERPS usage at the organisational layer of HEIs in Pakistan?

RQ2: Which factors contribute to ERPS usage at the departmental layer of HEIs in Pakistan?

RQ3: Which factors contribute to the usage of ERPS at the end-user layer of HEIs in Pakistan?

RQ4: What is the overall level of ERPS usage in HEIs in Pakistan?

1.5 Research setting

This study has some boundaries. Firstly, the higher education institutions in Pakistan that are using ERPS to perform organisational functions are included in the population. The study identified the factors affecting usage of ERPS and also examined the usage of ERPS in HEIs at three layers; organisational, departmental and end-user. In Pakistan, few areas are affected by terrorism, so the HEIs working in these areas are excluded from the study considering it as a limitation. The access is gained to top officials, faculty members and employees of each selected Higher Education Institution (HEI) for data collection process.

1.6 Research approach

Following the explanation of research problem, research gap, aims and objectives, and research scope, this section presents research approach applied in this study. In order to answer the research questions presented above, theories of the information system are discussed and factors are identified that are affecting usage of ERPS in HEIs for each of the three layers by extensive literature review, as described in Chapter 2. The deductive approach is used to formulate specific research hypotheses for the identified factors. Three paper based survey questionnaires are developed and used for the study and the hypotheses are tested by applying advanced Structural Equation Modelling (SEM) techniques on the data collected through a quantitative survey.

1.7 Contributions

Research on ERPS usage in HEIs is scarce, as a result of which, there is limited understanding of the factors affecting the use of ERPS. Moreover, the factors presented in the literature are discussed in isolation in various studies and the said studies mainly focused on one layer of the organisation at a time. This study is distinctive as it has presented a comprehensive Multi-Layer Usage Model (MLUM) and also mentioning the factors of each layer contributing to ERPS usage. This study is also unique in providing HEIs with an understanding of the significant factors contributing to usage of ERPS from a multi-level perspective within the organisation.

This study contributes to literature, theory development and research methodology. This study also provides guidelines to policy makers, higher education commission of Pakistan and administration local to HEIs, to increase ERPS usage in HEIs.

Theoretically, this study also makes a contribution by being the first of its kind that contributes to the literature in identifying factors affecting usage of ERPS at three layers of HEI; organisational, departmental and end-user. To the best of my knowledge, this type of research study is conducted for the first time that addresses three levels of the same organisation. Moreover, this study presents a conceptual framework to explore the factors contributing to ERPS usage at three distinct layers.

The study offers original contributions to knowledge. The contribution to literature in the under-researched topic worldwide and especially in the context of Pakistani HEIs is unique. It has opened an avenue for researchers to build upon the model, test it in different countries or different sectors and suggest improvements in the presented conceptual model.

Methodologically, this study is making a contribution by developing three questionnaires, one for each layer, based on the proposed multi-layer model, to test the model based on primary data collected from 18 HEIs of Pakistan. Furthermore, another contribution is the application of SEM techniques and extensions to examine the contribution of factors identified to ERPS usage at three layers; organisational, departmental, end-user.

The study also presents guidelines to the policy makers of higher education sector. The study may help policy makers in the identification of significant factors that contribute to ERPS usage. The officials of higher education commission and local administration of higher education institutions may take the required steps to increase ERPS usage in higher education sector. The findings of the research may also be helpful to highlight key areas that need the attention of policy makers and in strategic allocation of resources for ERPS usage.

1.8 Overall research design

In order to answer the research questions presented above, a deductive approach is used to formulate specific research hypotheses which are tested by applying advanced structural equation modelling techniques on the data collected through a quantitative survey in HEIs of Pakistan. Responses to the questionnaire are collected from three levels, organisational, departmental and end-user within the selected HEIs. The details of the methodology are presented later in research methodology in Chapter 3.

1.9 Dissertation outline

This section provides an overview of how the report is structured. The literature review and conceptual framework are presented in Chapter 2, which first addresses the existing literature on ERPS and then discusses ERPS adoption, implementation and usage in corporate sector and higher education sector. Further, the usage of ERPS across the three layers is discussed for a multi-level approach to the current study, followed by an overview of the factors affecting usage of ERPS in the literature. In consideration of the research gap, additional factors affecting usage of ERPS are discussed. A conceptual model is presented which provides a graphical illustration of the discussion of ERPS in HEIs, multi-level approach and the factors affecting usage of ERPS across the three layers in HEIs. Based on the conceptual framework, specific research hypotheses are formulated.

In Chapter 3, the methodology is suggested to test the hypotheses which justify the selection of post-positivist research philosophy and deductive approach. The methodology also describes the sampling techniques and sample size, along with the design of the three questionnaires which are pilot tested first. Also, the methods of data collection are explained. Finally, the analytical techniques are briefed.

Chapter 4 comprises a pilot study data collection and application of analytical techniques to conduct the statistical analysis of the collected data. The techniques include reliability of scale, descriptive statistics, finding demographic differences, exploratory data analysis, correlations, factor analysis, regression analysis and structural equation modelling. Based on the analysis results, the revised conceptual model is presented.

Chapter 5 discusses the sampling for full data collection process. It also shares the total questionnaires distributed and responses collected for the study. Further, the statistical tests are applied on full data, as discussed earlier in chapter 4. Moreover, overall ERPS usage is calculated for HEIs.

Chapter 6 offers application of SEM techniques on the data. SEM is applied as advanced level data analysis technique. Firstly, equations are formulated for three layers and then results of SEM are discussed in detail.

Chapter 7 presents SEM extensions that are an important part of SEM techniques. SEM extensions are applied to improve the models of three layers. This chapter also describes the improved results of refined models.

Chapter 8 concludes this research report. It summarises the discussion, research contributions, research significance, research limitations, ethical considerations, future directions and recommendations.

1.10 Summary

Firstly, this chapter has explained research problem and research gap. Secondly, research aims and objectives are presented along with research questions. The chapter has also explained scope and approach of research, contributions and overall research design. The chapter has also focused on explaining the dissertation outline of next chapters. The next chapter presents the existing literature on ERPS and proposed a conceptual framework for ERPS usage. It also explains the use of Layder’s (1993) research map for multi-level examination of the ERPS usage and a conceptual model is presented to graphically illustrate the factors affecting the usage of ERPS across three layers in HEIs. Specific research hypotheses are also presented in next chapter.

Chapter 2. Literature Review and Conceptual Development

2.1 Introduction

This chapter presents an extensive literature review on the topic and the conceptual framework for the current study to address identified research gap. The literature review on enterprise resource planning systems provides a basic understanding and preliminary foundation to propose a conceptual framework for the usage of enterprise resource planning systems, specifically for higher education sector. The chapter starts with definitions related to the usage of enterprise resource planning systems. Further, a literature review of usage of enterprise resource planning systems is presented with reference to the higher education sector. Furthermore, factors are identified from literature affecting usage of ERPS in the corporate sector and in higher education sector. Also, the multi-level approach to usage of ERPS is discussed. Moreover, the conceptual model is presented offering a multi-level examination of factors affecting ERPS usage at three layers of the organisation. Finally, research hypotheses are presented to conclude the chapter.

2.2 Definitions

2.2.1 Innovation

Innovation is defined as an idea or practice that is perceived as new by potential adopter (Rogers, 2003). The perceived newness of the idea is not related with time elapsed since the discovery of new knowledge; instead, it depends on the user perception that whether perceived newness of innovation is taken positive or otherwise (Rogers, 2003). The term innovation includes new solutions to technological, organisational and social issues and covers all activities from the discovery of new knowledge to its practical application (Kotsemir and Meissner, 2013). Innovation is also explained as an open, interactive, and non-linear learning process. This process is driven by laws, cultural practices, power game, the prevalence of trust within organisational structure and knowledge present in organisations (Vega and Brown, 2011).

Information Technology (IT) innovation expresses a new perceived idea based on information technology (Sujitparapitaya et al., 2012). Innovation is a complex phenomenon and while discussing information technology innovation of large systems for large-scale organisations, it becomes even more complex. Challenges are many that arise during the process of innovation. These challenges are determined by the complexity of the environmental conditions of target organisation (Kotsemir and Meissner, 2013). For example, there is a possibility of innovation not being profitable in monetary terms (Kotsemir and Meissner, 2013).

Innovation process comprises of distinct phases; knowledge, persuasion, decision to adopt, implementation, confirmation, and retirement (Rogers, 2003). Regarding the innovation life-cycle phases, the first four phases have been noticeably captured in the literature (Haddara and Zach, 2012) while the rest have not much gained the focus of researchers. The following section addresses the adoption of innovation.

2.2.2 Adopting innovation

Rogers (2003) explains adoption as opting for a new idea. Adoption is referred to as making maximum use of the new idea in the best possible way in the given circumstances. Early adopters are lead users and are characterised as risk takers while laggards are the last ones to adopt an innovation (Rogers, 2003). Technology Acceptance Model (TAM) is one of the most widely applied information system model to explain technological adoption by end-user. Davis proposed TAM in (1986) and tested the model in (1989) by statistical analysis using correlations between adoption levels and ease of use, usefulness, and intention to use. By following other organisations in adopting innovative business processes, an organisation can reduce the element of financial and strategic risk (Sujitparapitaya et al., 2012). As such, the consideration of organisational legitimacy, which is the adjustment of the organisation to the external environment, is crucial in this process.

2.2.3 Diffusion of innovation

Diffusion is a process in which an innovation is transferred through certain channels over a period of time among the members of the social system (Rogers, 2003). Diffusion of innovation is explained as the transfer of technology to the lowest level while utilising the benefits of the innovative systems (Huda and Hussin, 2013). Firstly, diffusion is recognised by communication of innovation and it is followed by practical diffusion of the innovation in the target market. It has multifold dimensions; diffusion in a geographical, cultural sense and also within the specific sector (Kotsemir and Meissner, 2013). The expected benefits of technological innovation may be realised if end-user gets the benefit of innovation (Bhattacherjee and Barfar, 2011). Various factors affect the diffusion of innovation in Small and Medium Enterprises (SMEs), including decision makers' behaviour, the involvement of complex technological skills, business partnerships in SMEs and government policies. Researchers suggest examining different disciplines and approaches to diffusion process (Vega and Brown, 2011). Successful diffusion of systems' adoption depends on acceptance by members of organisations (Vega and Brown, 2011). Mansell and When (1998) suggested that diffusion of technological systems in developing countries hugely depends on the development of tailor-made strategies keeping in view national and regional aspects. Technological innovations may not necessarily be diffused even after having clear advantages (Rogers, 2003), particularly in developing countries, the environmental factors are important to consider as they play a vital role in innovation diffusion (AlGhamdi et al., 2013).

Liang et al. (2007) developed and tested a model to explore the diffusion of ERPS in post implementation phase. While the top management mediation shows a positive impact on the diffusion of ERPS, the behaviour and attitude of end-user are altered positively by the exertion of institutional pressure (Weerakkody et al., 2009).

Various sectors have received different levels of attention by innovation researchers (Rogers, 2003), for example, the education sector has gained less attention, i.e., only 8 percent of all diffusion and usage publications are conducted on education sector (Rogers, 2003) and importantly the main focus remained on kindergartens while higher education sector did not gain significant attention. Table 2.1 explains research traditions of innovation literature including the percentage of all publications in the research area.

Table 2.1-Literature of innovation-major research traditions (Rogers, 2003)

Usage Research Tradition	Percentage of all Innovation Publications	Description
Anthropology	4%	Technological ideas
Rural Sociology	20%	Agriculture ideas
Education	8%	Teaching/learning innovations (kindergartens, math, team teaching)
Public Health	10%	Medical and health ideas
Communication	15%	News, events, new communication technologies
Marketing and Management	16%	New products (coffee, telephone, new communication technologies)
Geography	4%	Technological innovations
General Sociology	9%	A wide variety of ideas
Others	14%	-

In particular, there are reviews of information system research conducted on its diffusion (Vega, 2010), as well as research barriers of information system diffusion (Attewell, 1992), particularly in the developing countries (Mansell and Wehn, 1998). Research has also been conducted on cross-country comparison affecting electronic commerce diffusion (Gibbs et al., 2003) as well as on the diffusion process in electronic business and small & medium enterprises (Thatcher et al., 2006, Wilkins and Swatman, 2006, Kshetri, 2007, Parker and Castleman, 2007, Cui et al., 2008, Udo et al., 2008). The literature of information systems is summarised in Table 2.2 (Vega, 2010). Table 2.2 summarises some significant previous work done on diffusion of information systems. A number of factors are identified by these studies that affect diffusion of information systems in various sectors. The studies have been conducted to observe the diffusion of internet (Wolcott et al., 2001), diffusion of e-commerce (Gibbs et al., 2003, Thatcher et al., 2006, Kshetri,

2007) and diffusion of technology in SME sector (Oyelaran-Oyeyinka and Lal, 2006, Kshetri, 2007). However, the factors affecting diffusion of ERPS, particularly in the higher education sector have not been addressed. Mansell (2001) and Wilkins & Swatman (2006) have highlighted the importance of context-based approach to study the effect of various factors and strategies in assessing the usage and absorption of information systems. From this literature, it can also be inferred that macro variables of the environment have been given more importance, whereas micro level, context-based variables have been left un-addressed. Literature summarised in this table forms the identification of literature gap of this study, by highlighting the un-explored areas. It also provides the guidelines for identifying relevant factors to be selected for a context-based study of usage of ERPS in higher education sector.

Table 2.2-Literature of information systems

References	Description
Attewell (1992)	Factors affecting IS diffusion. Know-how and organisational learning as barriers of IS diffusion. Some institutions can easily overcome these barriers than others e.g. service bureaus, consultant. Simplification is also one way to overcome these barriers.
King et al. (1994)	Institutional factors affecting innovation absorption. Types of institutional interventions: influence and regulatory, and supply-push and demand-pull. Concepts about institutions, e.g. interest groups, changing role of institutions, and variation of institutional needs over time.
Mansell and Wehn (1998)	Suggesting context based evaluation. Developing countries should specifically focus on using applications and modernising basic infrastructure. National and regional IS strategies vary depending on local technological strengths and social and economic priorities. The systems of innovation should consider the skills of users and developers, cost reduction to access networks and applications and local and international e-legislation.

References	Description
Mansell (2001)	Factors effecting performance of firms using e-commerce. Analysis of firms in developing countries that use e-commerce to access global markets. This access is more than just the technological divide. It also includes developing trusted relationships, marketing strategies, logistic management, production efficiency, etc.
Wolcott et al. (2001)	Factors affecting diffusion of internet based on SIA and DOI. Framework for describing the diffusion of the internet in countries. It is based on following dimensions: pervasiveness, geographical dispersion, sector absorption, connectivity, Infrastructure, organisational infrastructure, and sophistication of use. They tried to relate the dimensions to some concepts of the SIA and the DOI.
Gibbs et al. (2003)	Factors affecting e-commerce diffusion. A cross-country comparison of multi-level factors affecting e-commerce diffusion. Business-to-Business is driven by global competition and multi-national corporations, whereas business-to-consumer is driven by local consumer markets. Some policy recommendations, e.g. Trade and telecommunications liberalisation, e-commerce promotion, and e-legislation.
Baskaran and Muchie (2006)	Factors affecting development of ICT industry. A cross-country description of the development of the ICT industry and the access to infrastructure and basic equipment. Comments on public policies. They tried to use some concepts of the SIA.
Oyelaran-Oyeyinka and Lal (2006)	Factors affecting use of technology in export SMEs. A cross-country comparison of how export SMEs in developing countries learn about technologies and their uses, e.g. training, learning-by-doing, learning-by-using, and searching. Some recommendations, e.g. training centres co-funded by public agencies and providers, marketing centres giving information and organising joint international promotional activities, and dissemination of basic infrastructure. They used some concepts of the SIA.
Thatcher et al. (2006)	Factors affecting B2B e-commerce diffusion. Multilevel factors affecting business-to-business e-commerce diffusion in Taiwan. The factors are classified as organisational, industrial, cultural, and governmental.
Wilkins and Swatman (2006)	Importance of context-based approach. Application of evolutionary concepts to IS diffusion, e.g. the approach of innovation in market environments, diffusion as a non-linear and rarely predictable process, and the policy-maker role as a builder of innovative infrastructure jointly with local institutions in order to seek context-specific and path-dependent solutions.

References	Description
Kshetri (2007)	Factors affecting e-business diffusion. Multilevel factors affecting e-business diffusion in China. The factors are strong nationalism, business and social networks, state's interventionism in the economy, political cognitive and normative factors, regulative uncertainty, and professional associations.
Parker and Castleman (2007)	Factors affecting technology usage in SMEs. The relevance of external influences, e.g. Government, education institutions, and industry associations. They explained specific types of interventions and knowledge gaps in suppliers. Also, the relevance of SME-focused systems, longitudinal research including the verification of the actual use of the systems, and cross-cultural variances in SMEs.
Cui et al. (2008)	Factors affecting ICT infrastructure and usage. A study of Shanghai's firms that report a high impact of government policies in firm's ICT infrastructure and management decisions, but the low impact in IS usage.
Udo et al. (2008)	Factors affecting ICT diffusion. A cross-country comparison of multi-level factors affecting ICT diffusion. ICT diffusion is negatively impacted by poor infrastructure, income inequality, and adult illiteracy.

2.2.4 Organisational culture

Culture comprises of assumptions, values, behaviours and norms of members of the organisation. Changes in the culture of organisations occur over a long period of time. Organisations with stagnant culture face decline in performance. Sustainability of organisational culture can depend on innovation that supports fresh ideas, refined processes and better ways of doing business operations (Nada et al., 2012).

In organisations, behaviours are generally shared. Integration view of culture exhibits as consisting of interpretations shared by the members of the organisation (Martin, 2002). The concept of differentiation exposes sub-cultures prevailing in the organisation as well as sub-cultural conflicts and contradictions within the organisation. Fragmentation perspective expresses ambiguity as important part of culture. As such, it can be argued that a single perspective alone is not sufficient to understand the organisational culture (Waring and Skoumpopoulou, 2012).

2.2.5 Change and resistance

As change is inevitable, the associated organisational response to change may differ, depending on various internal factors or external pressures exerted by the environment (Weerakkody et al., 2009). Resistance may occur at organisational, group or individual level (Huda and Hussin, 2013). Before implementing any system modifications in the organisation, resistance factor must be addressed to help the organisation in managing innovation process and to handle any emerging issues (Huda and Hussin, 2013). Boudreau and Robey (2001) conducted a study in a university environment and found that users continued to maintain shadow system. It is also expressed that users are using the traditional system as they are doing previously. Therefore, motivating users is an important factor to take into consideration otherwise they may continue using legacy systems (Liang et al., 2007). It is expressed that if senior management and few individuals accept the need for change in the institutional system, even then it may lead to failure without the support of staff. To understand the response of end-user to innovation, Rogers (2003) explained the process by presenting a theory called Diffusion of Innovation (DOI) that addressed the ways in which users may resist innovations proposed by management based on their perceived attributes. After the change is being proposed, end-users assess it for relative advantage in their specific circumstances, and then, access innovation for compatibility. Compatibility is stated as the degree to which it is consistent with existing practice and values. Similarly, observability is also be taken into consideration. It is explained as the degree to which result of change is visible, however, it is important to consider the complexity of the system as perceived difficulty to understand or use the system (Rogers, 2003). The increased complexity can lead to the increased resistance in accepting and using the information systems.

2.2.6 Enterprise resource planning systems

Enterprise Resource Planning Systems are a business management system that consists of multiple software integrated into one package, used to handle all business processes of the organisation from all functional departments (Ross, 2007). ERPS combine data from all functional areas of the organisation into one real-time database to facilitate various departments to conveniently share information (Fowler and Gilfillan, 2003) as well as disseminate information throughout the organisation (Schlichter and Kraemmergaard, 2010). ERPS are also considered as a comprehensive package solution that caters the requirements of all functional departments keeping in view the overall organisational process in order to meet the goals of organisation (Fowler and Gilfillan, 2003); also, ERPS can be modified up to some extent to be suited for the needs of the target organisation.

Parallel to the emphasis of innovation management researchers on the significance of adopting a technological innovation, organisations are also adopting ERPS. From the organisational perspective, ERPS are the key technological innovation and are supplied by different companies worldwide; major players include SAP and Oracle.

2.3 Literature review

2.3.1 Enterprise resource planning systems

For more than three decades ERPS have been used by the manufacturing industry. More recently HEIs have opted to deploy ERPS. HEIs are spending in excess of \$20 million each to implement modern enterprise resource planning projects (Swartz and Orgill, 2001). Traditionally, subunits of HEIs store much of the data locally. This can lead to certain issues at the organisational level, including data duplication, lack of access to data when needed, which can subsequently lead to the inefficient output during the processing of pertinent tasks (Fowler and Gilfillan, 2003). Possible causes of failure may include resistance by users, the not understanding perception of the user, failing to accommodate cultural changes required, and failure of business process re-engineering (Fowler and Gilfillan, 2003). These reasons contribute to increased difficulty level of convincing employees about potential benefits of the system (Park et al., 2007). Consequently, variation is found in the level of achievement from highly satisfactory to complete failures (Fowler and Gilfillan, 2003). Moreover, institutional forces play a significant role in the post-implementation absorption of ERPS, where absorption is the extent to which the use of technology diffuses across the organisation at all layers to materialise the benefits of implementation. Accordingly, there is a need of identifying technically strong users to help fellows adapt through extensive training. Another possibility that may cause a failure that the top management announces ERPS implementation just to satisfy stakeholders involved or because of external pressure without being committed fully to the usage of ERPS (Liang et al., 2007).

According to studies, the failure of ERPS implementation has been reported to be up to 75 percent (Thavapragasam, 2003), and typically ranging from 40 to 90 percent (Shanks, 2000). Consequently, ERPS have attracted the interest of information system researchers (Haddara and Paivarinta, 2011), of which the implementation of ERPS seems to have gained the most focus. What remains comparatively under-examined is post-implementation of ERPS (Waring and Skoumpopoulou, 2012). The literature does identify the basic ingredients for the success of ERPS as a model. The framework presented in Figure 2.1 suggests that project success revolves around the relationship between processes, people, culture and systems (Khan et al., 2010).

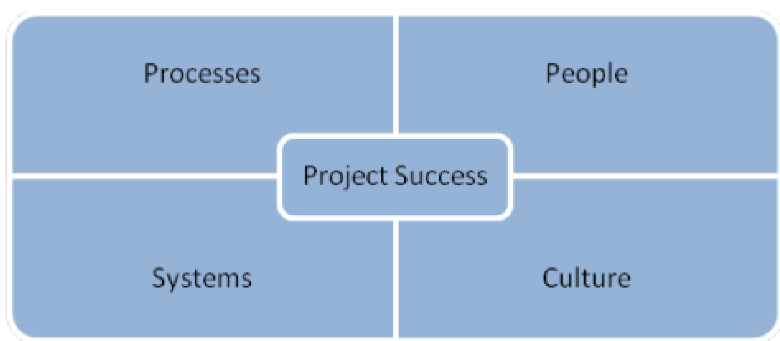

Figure 2.1-Information technology project partnership frameworks (Khan et al., 2010)

2.3.2 ERPS in higher education institutions

The literature on enterprise resource planning systems is available but the education sector has received little attention (Melão and Loureiro, 2017). The research on enterprise resource planning systems in higher education institutions is still limited, therefore the knowledge about the factors contributing to the success of the ERPS is limited (Soliman and Karia, 2017). ERPS in higher education institutions is a debated topic currently and the challenges faced by the developing countries have become an area of focus (Zschieck et al., 2016). Following the enterprise resource planning revolution in which a vast majority of Fortune 500 companies adopted ERPS (Ross and Vitale, 2000, Scott and Wagner, 2003), the higher education sector in many countries across the world have also opted for ERPS, such as that in USA (King et al., 2002), UK (Pollock and Cornford, 2004), Belgium, France and Switzerland (Charlier et al., 2004), Slovenia (Zornada and Velkavrh, 2005), Columbia (Graham, 2009) and Australia (Nielsen, 2002, Fisher, 2006, Rabaa'i et al., 2009, Abugabah and Sanzogni, 2010). Literature suggests that ERPS have recorded significant growth in higher education sector (Waring and Skoumpopoulou, 2012). In contrast with the corporate units, HEIs have a different set of operational departments. That includes general administration, admissions, student record, financials, grade books, campus community, advisement, hostel management and alumni management, etc. Through ERPS, HEIs are considering themselves to be capable of efficiently handling multiple campuses through a central database. Different processes share data across the HEI. For example, data of students may change over a period of time; admission, enrollment, student accommodation, retention, graduation and also once students become alumni, they may become a donor to the HEI (Sujitparapitaya et al., 2012).

The major advantages of implementing ERPS are said to include the enhanced performance of the institutions, reduced business risk, lowered operational costs and higher profitability (King, 2002). However, not all HEIs successfully diffuse the adoption of ERPS due to the complexity and adaptability involved (Hong and Kim, 2002). It is highlighted that role conflicts may cause disputes and fear of elimination of employees may affect the ERPS (Adam et al., 2017). There is also a debate over the potential advantages of adopting such innovation, along with barriers to design and utilisation. Some researchers have addressed ERPS implementation in HEIs (Waring and Skoumpopoulou, 2012) and few have raised concerns at the under-utilization of ERPS in HEIs in the UK (Pollock and Williams, 2009). One possible reason may be the incompatibility of ERPS with the operations of the organisation. This may especially be the case when the academics are kept out of consultation process that may create resistance to the use and effective utilisation of the systems (Waring and Skoumpopoulou, 2012). Additionally, cultural values specific to an institution can also effect HEI revolution (Huda and Hussin, 2013). Moreover, the decision to implement ERPS in HEI and its usage may be influenced by cultural values as well as the historical context (Huda and Hussin, 2013). As ERPS enable HEIs to track organisation-wide data, therefore it is pertinent to mention that ERPS in HEIs may be explored at various levels: organisational, departmental and end-user.

2.3.3 ERPS in Pakistan

The findings of research on ERPS in the developed countries may be generalizable to Pakistan (Khan et al., 2010). This may be subject to cultural aspects and local values. Researchers have also acknowledged the existence of barriers to ERPS usage in the unique cultural context of Pakistan, including a tendency to blame everything on government or other individuals, complaints of poor IT infrastructure and lack of adequate training (Khan et al., 2010).

In recent years, some research has been conducted in ERPS in various public and private organisations in Pakistan. For example, Shad et al. (2012) focused on four different industries in Pakistan (NADRA[1], OGDCL[2], PTCL[3] as well as HEC[4]) to explore the contextual factors in the complexity of implementation of ERPS and concluded that ERPS implementation is extremely affected by contextual factors. However, focusing on one sector may provide more in-depth information. Similarly, Shah et al. (2011) investigated the barriers to successful implementation of ERPS in an anonymous organisation in Pakistan and found a large gap between the promises of vendors and reality faced by the end-users of ERPS. Moreover, other researchers in Pakistan have focused only on the institutional or end-user level, for example, Hameed et al. (2012) focused on the management and organisations but did not explicate the contextual issues specific to the industry or the country. Furthermore, the other studies identified in Pakistani context have advocated high research aims of comparing the context of developing countries with the developed countries but have undertaken unsatisfactory methodologies. Similarly, another study is conducted to explore the factors affecting users'

1 National Database and Registration Authority, Pakistan

2 Oil and Gas Development Company Limited, Pakistan

3 Pakistan Telecommunication Company Limited

4 Higher Education Commission of Pakistan

behaviour of ERPS in the telecommunication based organisation in Pakistan with only 255 responses (Kanwal and Manarvi, 2010). Therefore, the literature review indicates the need for a multi-level approach to understanding the dynamics of ERPS usage specific to local organisational culture.

2.3.4 ERPS in HEIs in Pakistan

Researchers (e.g., Walsham and Sahay, 2006) have acknowledged that the research context of Pakistan is unique in terms of the influence of the complex interplay of issues of power, politics and institutional structures which may be similar to other developing countries. In the broader context of Pakistan, there are some indicators of its emergence as an information-based society via rapid growth in information technology services (King, 2002). Higher Education Commission (HEC) of Pakistan envisioned to make Pakistan a knowledge-based economy (Fisher, 2006). All over the world, HEIs have made huge expenditures in their ERPS during last few years (Abbas, 2011). Similarly, in Pakistan, to implement ERPS in higher education institutions, HEC has purchased Campus Management System (CMS) and has implemented it in eight public sectors HEIs in Pakistan. These HEIs are selected nationwide demographically and geographically. HEC has planned to implement CMS to all public sector HEIs across the country (HEC Pakistan, 2009), while few private sector HEIs are using different ERPS.

The benefits accumulated by HEC through the adoption of ERPS include streamlining the academic and administrative activities of universities and provision of concurrent information to all stakeholders. It has several modules; one module serves one functional area of HEI. Multiple functional areas include student admissions, student records, grade books, academic advisements, student financials, campus community, students and faculty campus self-service, hostel management and contributor relations (HEC Pakistan, 2010).

The research studies on HEIs in Pakistan indicate poor performance and dissatisfaction of stakeholders (Schlichter and Kraemmergaard, 2010). As a consequence, there have been very few studies in this context; hence the research on HEIs remains underdeveloped (Abbas, 2011). Furthermore, the administrative culture of Pakistan is having an element of *sifaarish*[5] and red-tape (Islam, 2004) as well as corruption across throughout the macro and micro levels of Pakistani society (HEC Pakistan, 2012a). It effects selection of resources on merit and in return, those resources are not able to produce the desired results. Moreover, in Pakistani public sector HEIs, the majority of employees remain on the job till retirement; employee turnover ratio is minimal, and there is an inclination to do work manually.

Abbas (2011) suggested that the survival of EPRS is highly dependent on the training of employees. Furthermore, Rajapakse and Seddon suggested that there was a lack of comprehensive training along with a sense of ownership for ERPS that may create obstacles in the usage of ERPS (2005). Also, the empirical research on the barriers to successful ERPS in a public organisation in Pakistan suggested

5 Biasness and/or recommendations based on personal, social or political network regardless of performance or capabilities; generally used as a criterion for decisions related to hiring, promotion etc. in a wide array of public and private institutions in Pakistan

the need to generalise the research findings to higher education sector (Shah et al., 2011).

The research context of Pakistan is unique within the South Asian context because of its distinct cultural characteristics including the interplay of issues of power, politics and institutional structures (e.g., Walsham and Sahay, 2006). Higher education commission of Pakistan envisioned to make Pakistan a knowledge-based economy founded on innovation (Fisher, 2006), and ERPS are implemented in selected HEIs (HEC Pakistan, 2009). Some private sector HEIs have also adopted ERPS (Nizamani et al., 2014), however, there is a dearth of specific statistics. Research on ERPS related issues in Pakistan is emerging (Schlichter and Kraemmergaard, 2010). Moreover, researchers think ERPS have not produced the desired results (Batada and Rahman, 2014). As the survival of EPRS is highly dependent on the training of employees (Abbas, 2011), providing inter-departmental support to the end-users can help achieving desired results (Batada and Rahman, 2014). Recently, a conceptual framework for ERPS evaluation in HEIs in Pakistan has been forwarded that focuses at the organisational level (Nizamani et al., 2014), and, a study on manufacturing firms in Sialkot city in Pakistan acknowledges the multiple layers within an organisation (Riaz et al., 2014) but ignoring the wider contextual factors can lead to the failure of foreign ERPS in Pakistan (Bahoo, 2011) while the empirical evidence for top management support and organizational culture is collected only from the end-users (Riaz et al., 2014). Although relevant empirical and conceptual studies are emerging, existing research on HEIs remained underdeveloped (Abbas, 2011) and there is a clear need to develop the existing research on ERPS in Pakistani context (Riaz et al., 2014), particularly in the higher education sector (Shah et al., 2011).

2.4 Theoretical framework

2.4.1 Theories of information systems

Literature review on the usage of Information Systems (IS) follows three major theoretical frameworks, i.e., technology acceptance model (Davis Jr, 1986), decomposed theory of planned behaviour (Taylor and Todd, 1995) and the unified theory of acceptance and use of technology (Venkatesh et al., 2003). These are individual-level models that help in predicting the intention and behaviour related to the usage of IS; however, the role of organisational structures and strategies remains under-addressed in these theories (Sun and Bhattacherjee, 2011). For example, Theory of Reasoned Action (TRA) was introduced by Fishbein and Ajzen (Fishbein and Ajzen, 1975) which addressed the determinants of behaviours of users. It explained that a person's performance of a specified behaviour is determined by the behavioural intention. Further, they described attitude as positive or negative feelings of a person as shown in Figure 2.2.

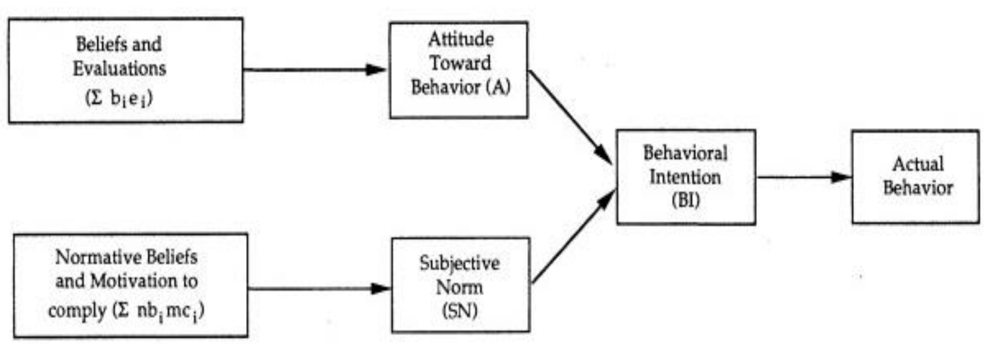

Figure 2.2-Theory of reasoned action (Fishbein and Ajzen, 1975)

Later, Technology Acceptance Model (TAM) was developed to predict individual adoption and use of new technologies (Davis Jr, 1986, Davis et al., 1989). It provides an understanding of the individual-level factors that influence behavioural intention (Taylor and Todd, 1995) and remains one of the most widely applied IS models to explain the end-user technological adoption (Sujitparapitaya et al., 2012). The model is presented in Figure 2.3.

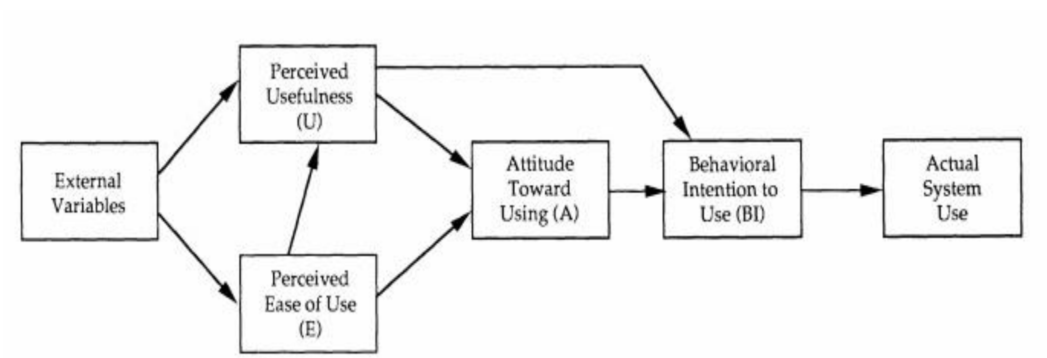

Figure 2.3-Technology acceptance model
(Davis Jr, 1986, Davis et al., 1989)

However, TAM has a limited focus on end-users (Frambach and Schillewaert, 2002, Sun and Bhattacherjee, 2011), therefore, it is not a solution for multi-level examination of IS usage. Huda and Hussin (2013) presented an innovation model to measure information technology effectiveness in the organisations, however, the proposed model is yet to be tested to confirm the relationship between variables. They have plans to conduct a study for validation of the model by collecting data in a developing country. This gap gives an opening to researchers to test the model proposed or in adapted form. This model is unique as the constructs presented in this innovation model attempt to cover the organisational layer factors, more comprehensively as compared to other models, to measure implementation effectiveness in the organisations. Other models from literature mainly focus on the factors associated with the end-users. The model is presented in Figure 2.4.

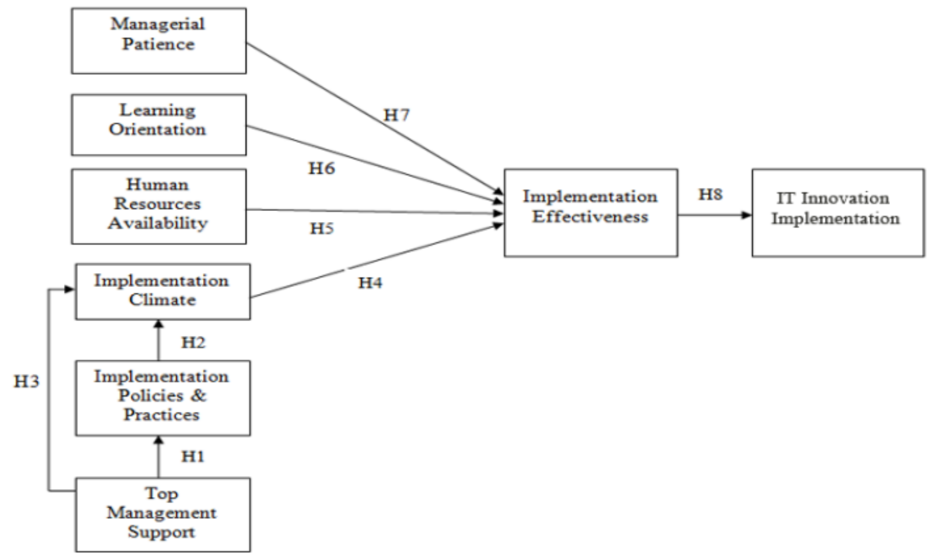

Figure 2.4-Model for IT innovation implementation effectiveness (Huda and Hussin, 2013)

The conceptual framework of this study is derived from Unified Theory of Acceptance and Use of Technology (UTAUT) developed by Venkatesh et al (2003). This theory explains the acceptance of information technology by an individual and it unifies eight models that explain determinants of acceptance and usage of information technology. These models include theory of reasoned action by Fishbein and Ajzen (1975), technology acceptance model by Davis et al (1989), theory of planned behavior by Ajzen (1991), model of personal computer utilization by Thompson et al (1991), motivational model by Davis et al (1992), combination of technology acceptance model and theory of planned behaviour by Taylor and Todd (1995), innovation diffusion theory by Rogers (1995) and social cognitive theory by Campeau and Higgins (1995). The research model presented in Figure

2.5 identifies four factors that affect behavioural intentions i.e. performance expectancy, effort expectancy, social influence and facilitating conditions. These factors affect an individual's intentions to use the ERP systems. Further, the raised behavioural intention leads to positive effect on usage behaviour. The arrows from independent variables towards the mediating variable and dependent variable indicate a mediation effect. The model also shows that gender, age, experience and voluntariness of use are used as moderating variables. These variables moderate the effect of independent variables on the mediating variable, i.e. behavioural intention.

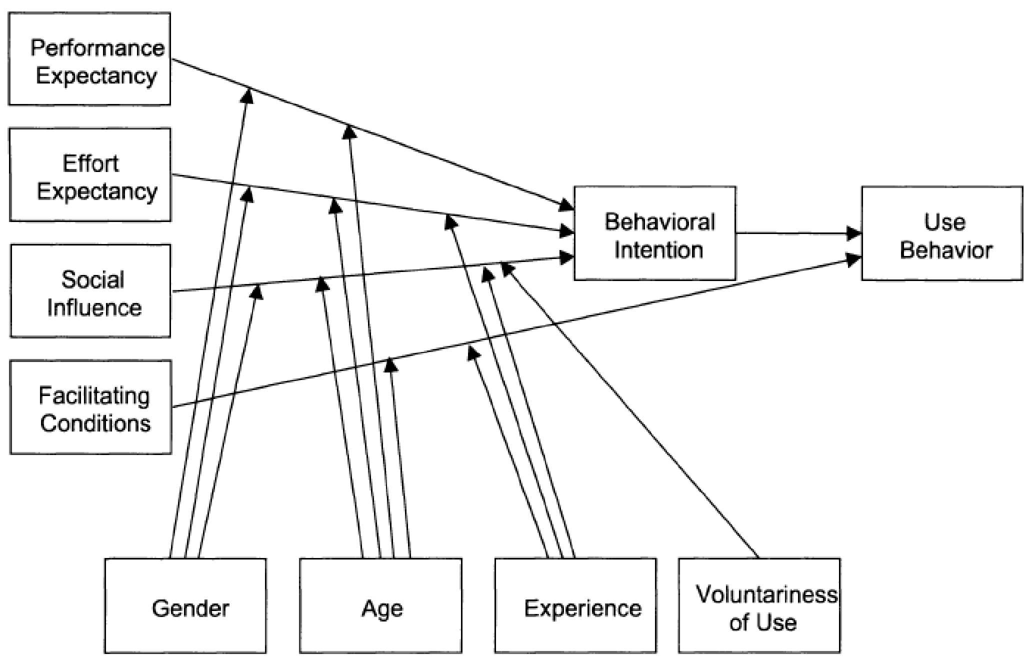

Figure 2.5-Unified theory of acceptance and use of technology (Venkatesh et al., 2003)

However, this model does not cover many important factors that may potentially affect the usage of ERPS. Particularly, the block variable of facilitating condition present a significant window of literature gap. There is a need to specify and separately observe which facilitating condition and at which level, significantly affect ERPS usage. To address this, the next sections present the factors present in literature affecting ERPS usage.

2.4.2 Factors of ERPS usage in existing literature

Wang et al. (2008) stated that ERPS success factors are various in diverse business environments. It is found that consistency has a significant impact on ERPS success in organisations and it is suggested to examine consistency among critical factors i.e., end-user support. End-user support is referred to the psychological state of participation in the system. If end-users are not willing to accept the change, they may resist. Therefore, it is important to involve end-user in the process from start. It is also expressed that consistency in facilitating factors of organisational ERPS contributes to efficiency and effectiveness (Wang et al., 2008). Moreover, it is found that the capabilities of users to assimilate and apply new knowledge have an effect on its value. The ability of the user to understand ERPS influences its performance. It is also observed that organisational support moderated the relationship between their absorptive capacity and performance (Park et al., 2007). It is also stated that training plays a vital role in learning new technology. The role of management is to arrange extensive training for end-users, whether they are formal or informal (Boudreau, 2003) as explained in Figure 2.6.

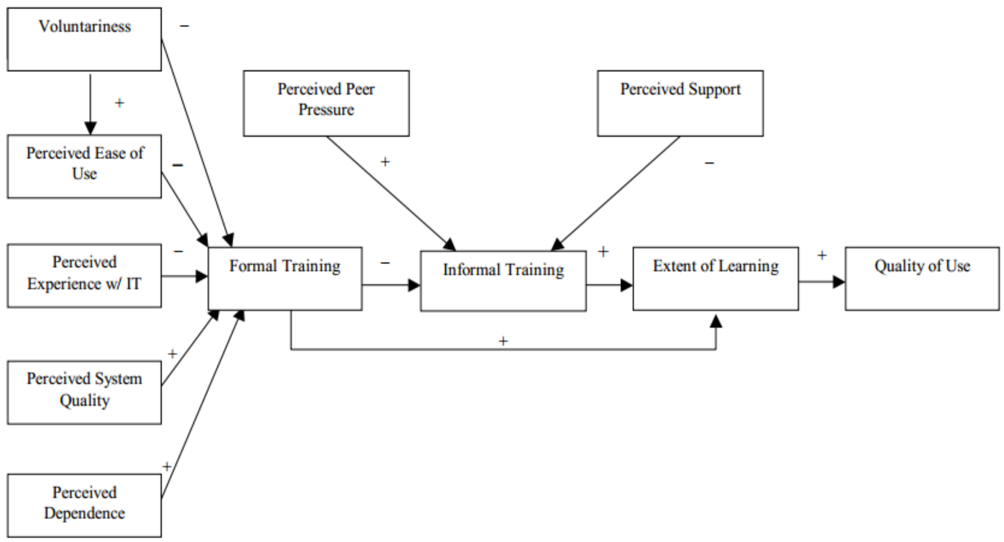

Figure 2.6-Learning impacted by formal and informal training (Boudreau, 2003)

Furthermore, the existing body of literature on ERPS acknowledges that the usage of innovations depends on the culture of the region and more specifically on the organisational culture (Wejnert, 2002, Al-Zaabi et al., 2012, Choudrie et al., 2012). Although culture is very complex but it can offer a better understanding when considering the social, people and human aspects of electronic implementation in public sector (Choudrie et al., 2012). For example, academic institutions can have a culture of institutional resistance to ERPS usage and end-users can resist learning cutting edge technologies (Macfadyen and Dawson, 2012). Advancement of a culture of instrumental command and control can contrast with the values of HEI (Waring and Skoumpopoulou, 2012). Macfadyen and Dawson (2012) argued that institutional resistance is found in the culture of academic institutions. Considering the usage of ERPS in an HEI, end-user may be resistant to learn cutting edge technologies (Macfadyen and Dawson, 2012).

It is emphasised that the head of HEI must play a motivating role to successfully manage the process of innovation. In the usage of an information system, numerous problems are faced by organisations, including cultural and behavioural issues of the employees. Considering Asia and specially focusing on the Sub-Continent, research on the local culture suggests that employees are accustomed to being a part of one organisation, and specifically, working in one functional area for the whole job tenure within that organisation; this can develop resistance to accept innovations and their willingness to change themselves may be badly affected (Rajapakse and Seddon, 2005). Age factor of end-user is another issue that hinders them from learning innovative system as they may be passing through last few years before retirement.

A review of the existing literature on the usage of innovation has produced a plethora of factors specific to various research contexts. As the absolute inclusion of each research publication relevant to the topic is beyond the resources available for this research study, however, the important factors identified from a review of the literature are examined here. The factors from corporate sector and higher education sector discussed in the literature are presented in Table 2.3.

Table 2.3-Factors emerged from literature of HES and corporate sector

Factors	Sector	References
Compatibility	Higher education	(Rogers, 2003) (Bradford and Florin, 2003) (Pollock and Williams, 2009)
Organisational Climate and Control	Higher education	(Huda and Hussin, 2013)
Organisational Policies	Higher education	(Huda and Hussin, 2013)
Managerial Patience	Higher education	(Ke and Wei, 2008)

Factors	Sector	References
Training	Higher education	(Boudreau, 2003) (Ko et al., 2005) (Rajapakse and Seddon, 2005) (Khan et al., 2010)
Self-Determination	Higher education	(Sehgal and Stewart, 2004)
Top Management Support	Higher education & Corporate	(Rogers, 2003) (Bradford and Florin, 2003) (Park et al., 2007)
Complexity	Higher education & Corporate	(Davis et al., 1989) (Hong and Kim, 2002) (Rogers, 2003) (Shad et al., 2012) (Kotsemir and Meissner, 2013)
Decision Making and Controls	Higher education & Corporate	(Cui et al., 2008) (Ke and Wei, 2008) (Wang et al., 2008)
Observability	Higher education & Corporate	(Rogers, 2003) (Macfadyen and Dawson, 2012)
Culture	Higher education & Corporate	(Wejnert, 2002) (Bradford and Florin, 2003) (Islam, 2004) (Rajapakse and Seddon, 2005) (Haddara and Paivarinta, 2011) (Choudrie et al., 2012) (Waring and Skoumpopoulou, 2012) (Al-Zaabi et al., 2012) (Nada et al., 2012)
Learning	Higher education & Corporate	(Attewell, 1992) (Oyelaran-Oyeyinka and Lal, 2006) (Ke and Wei, 2008) (Vega and Brown, 2011)
Resistance	Higher education & Corporate	(Davis et al., 1989) (Rogers, 2003) (Fowler and Gilfillan, 2003) (Rajapakse and Seddon, 2005) (Chou and Chang, 2008) (Wang et al., 2008) (Weerakkody et al., 2009) (Waring and Skoumpopoulou, 2012) (Huda and Hussin, 2013)
Ease of Use	Higher education & Corporate	(Davis et al., 1989) (Macfadyen and Dawson, 2012)
Participative Decision Making	Corporate	(Bradford and Florin, 2003) (Ke and Wei, 2008) (Wang et al., 2008)
Top Management Belief	Corporate	(Liang et al., 2007)
Relative Advantage	Corporate	(Rogers, 2003) (Macfadyen and Dawson, 2012) (AlGhamdi et al., 2013)

Factors	Sector	References
Competitive Pressure	Corporate	(AlGhamdi et al., 2013)
Management Maturity	Corporate	(Haddara and Paivarinta, 2011)
Expected Benefits	Corporate	(Bradford and Florin, 2003) (Chou and Chang, 2008) (Park et al., 2007) (Liang et al., 2007) (Schubert and Williams, 2009b) (Schubert and Williams, 2009a) (Youngberg et al., 2009)
Usage Pressure	Corporate	(Liang et al., 2007) (Weerakkody et al., 2009)
Top Management Participation	Corporate	(Bradford and Florin, 2003) (Rogers, 2003)
Top Management Support and Collaboration	Corporate	(Ke and Wei, 2008) (Wang et al., 2008) (Huda and Hussin, 2013)
Tolerance for Conflicts and Risks	Corporate	(Bradford and Florin, 2003) (Ke and Wei, 2008)
Consistency	Corporate	(Wang et al., 2008)
Efficiency	Corporate	(Mansell, 2001) (Chou and Chang, 2008) (Ke and Wei, 2008) (Wang et al., 2008)
User Support	Corporate	(Walsham and Sahay, 2006) (Wang et al., 2008)
Absorptive Capacity	Corporate	(Ko et al., 2005) (Park et al., 2007) (Sujitparapitaya et al., 2012)
Power Sharing	Corporate	(Ke and Wei, 2008)
Attitudes	Corporate	(Davis et al., 1989)
Subjective Norms	Corporate	(Nada et al., 2012)
Perceived Usefulness	Corporate	(Davis et al., 1989)
Awareness	Corporate	(AlGhamdi et al., 2013)
Motivation	Corporate	(Ke and Wei, 2008) (Schubert and Williams, 2009b)
Task Efficiency	Corporate	(Chou and Chang, 2008) (Wang et al., 2008)

The factors specific to higher education sector are compatibility, self-determination, organisational policies, managerial patience, training, and, organisational climate and environment.

The factors specific to the corporate sector are competitive pressure, relative advantage, management maturity, expected benefits, consistency, efficiency, user support, ERP usage pressure, power sharing, absorptive capacity, attitudes, subjective norms, perceived usefulness, awareness, motivation, task efficiency, tolerance for risks and conflicts, participative decision making, top management belief, top management participation and top management support and collaboration.

The factors specific to both corporate and higher education sector are complexity, observability, culture, resistance, ease of use, learning, top management support and decision making and control.

The graphical representation of the same is presented in Figure 2.7:

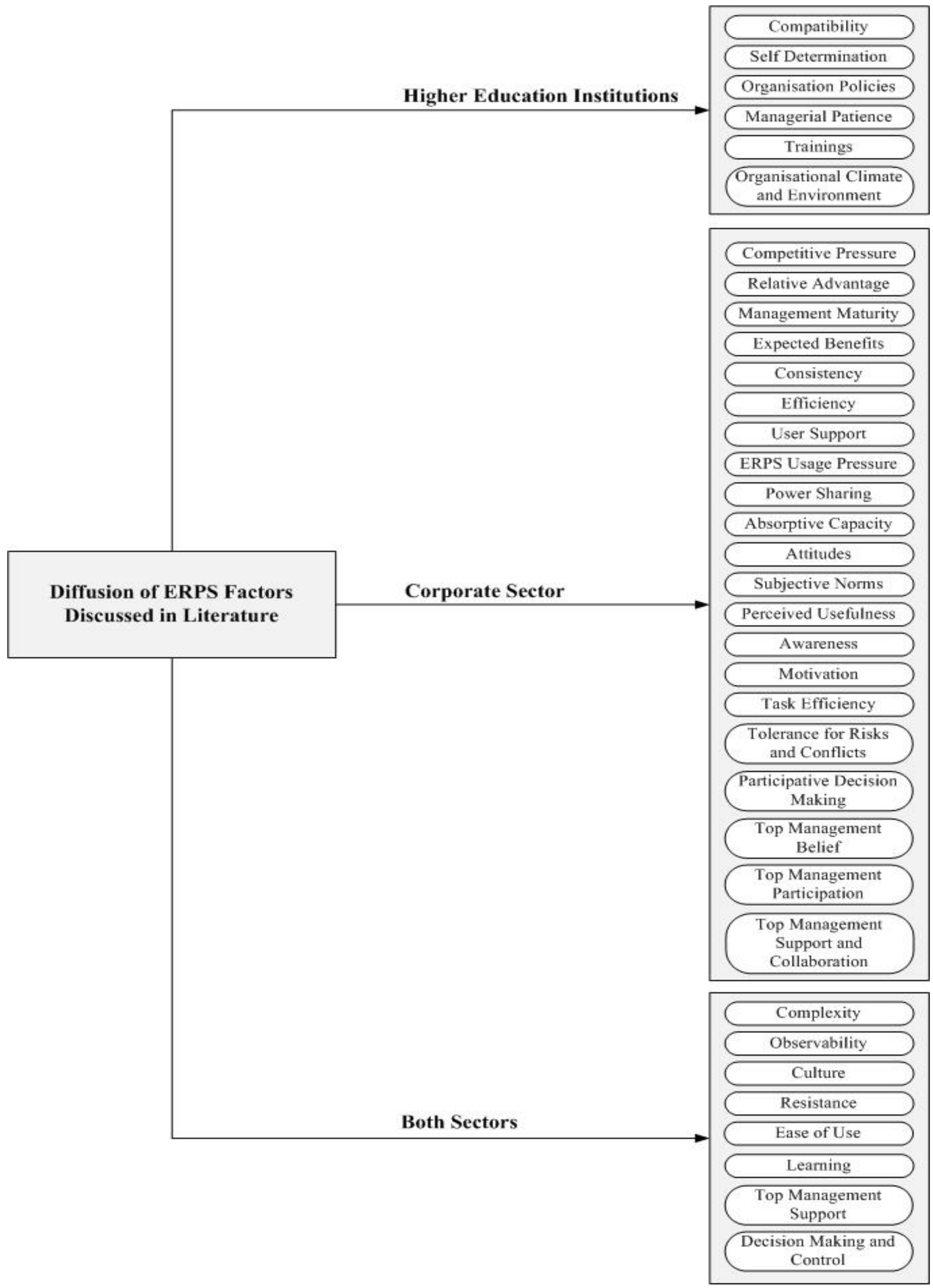

Figure 2.7-Innovation usage factors from literature in HES and corporate sector

2.4.3 Multi-level approach to usage of ERPS

As discussed in the previous section, literature review on the usage of information systems follows three major theoretical frameworks i.e., the technology acceptance model (Davis et al., 1989), decomposed theory of planned behaviour (Taylor and Todd, 1995) and the unified theory of acceptance and use of technology (Venkatesh et al., 2003). These are individual-level models that help predict the intention and behaviour related to the usage of information systems; however, the role of organisational structures and strategies is neglected in these theories (Sun and Bhattacherjee, 2011). For example, TAM was developed to predict individual adoption and use of new information technologies (Davis et al., 1989). It provides an understanding of the individual-level factors that influence behavioural intention (Taylor and Todd, 1995) and is one of the most widely applied information systems models to explain the end-user technological adoption (Sujitparapitaya et al., 2012). However, multi-layer analysis of usage of information systems is limited to date (Frambach and Schillewaert, 2002, Sun and Bhattacherjee, 2011). In practice, organisations operate at multiple levels with interdependency of the levels. One level affects other levels in different ways, majorly local to the organisation. Vega and Brown (2011) argued that usage of ERPS at the organisational layer may be affected by usage of ERPS at other layers. They also asserted the need to conduct multi-level research that addresses usage process at each level of the organisation. This calls for a multi-level study of the organisation to explore the role and impact of top management and middle management on the end-users.

Layder's (1993) research resource map is a useful conceptual tool to link the multiple layers of analysis, i.e., the organisational, departmental and end-user layer. As shown in Figure 2.8, the research map suggests examining a social phenomenon in a particular context by which the self, the situated activity, the setting, the context and a temporal dimension such as history produces the macro-micro interaction.

The first element of Layder's (1993) research map is 'context', which is the broader macro-social system, including its values, traditions, relations, laws, resources and processes of control and autonomy. For the study, context is higher education sector.

The next element of 'social setting' denotes the immediate environment of social activity within the department of the HEI. For this study, this refers to the organisational layer or policy makers within the higher education institutions who can affect the usage of ERPS.

The next one is called 'situated activity' and it refers to the social interactions or the various types of social situations in which group members have dynamic face-to-face interactions. For the current study, this layer is taken as the departmental layer, as the departmental heads are assumed to play a supervisory role for the usage of ERPS and their role can influence the usage of ERPS at the end-user layer.

Lastly, 'self' refers to an individual's sense of identity, personality, experience, opinions and perception of the social world. In literature, 'self' is used to show how individuals are affected by and react to social situations (Carlsson, 2004). For the current study, 'self' refers to the end-user layer or the personal attributes, attitudes, values and understanding of the employees or faculty members using ERPS. Layder's (1993) research map is presented in Figure 2.8.

	Research Elements	Description	Research Focus	Research Objective
USAGE OF ERPS	Context	Macro social forms	Higher Education Industry of Pakistan	To set the factors contributing to usage of ERPS in the industrial context
	Setting	Immediate environment of social activity	Higher Education Institutes	To examine the factors contributing to usage of ERPS in HEI at Organisational Layer
	Situated Activity	Dynamics of face-to-face interaction	Departments of HEIs	To examine the factors contributing to usage of ERPS in HEI at Departmental Layer
	Self	Biographical experience and social involvements	End-Users in HEIs	To examine the factors contributing to usage of ERPS in HEI at End-User Layer

Figure 2.8-Research map
(Adapted from Layder, 1993, p.114)

In this study, the higher education sector of Pakistan is seen as the research context. The temporal dimension for this study is the usage of ERPS. Each of these layers is distinct and a combined understanding of these layers enables a linkage between the micro and macro levels of analysis to understand the usage of ERPS. For example, end-users do not use ERPS in isolation, but their usage depends on the resources, training, management behaviour, organisational goals etc., and in return, the organisational performance can be influenced by the usage of ERPS at the individual level. Vega and Brown (2011) have stressed to conduct multi-level research that addresses usage process at each level of the organisation. This research addresses the research gap to conduct a multi-level study of the organisation. The three layers for the current study are explained in the following section.

2.4.3.1 Organisational layer

This is the top layer of organisation and consists of top management officials and policy makers. The strategic planning at this level affects not only the overall organisational performance but the usage of ERPS at this layer generates the trickle-down effect of usage process to the lower layers of the organisation. The power distance between the layers of management, as well as the power distance between the management and the employees, is generally very large (Khilji, 2002). Additionally, the administrative culture for public sector institutions can differ from that of private sector institutions, particularly with regards to bureaucracy, corruption, red tape and nepotism (Islam, 2004). In the context of successful implantation in health care industry, top management support is reported to be critical (Anjum et al., 2015), although higher education sector did not gain any attention in the literature.

2.4.3.2 Departmental layer

The second layer, consisting of departmental heads, has direct interaction with the end-users of ERPS. Departmental heads are responsible for making decisions and taking measures to ensure that the policies regarding usage of ERPS received from the above organisational layer are effectively implemented at the lower level to produce the desired results. The gap between the written and the implemented policies with little or no accountability and inadequate measures to monitor the progress of implemented policies is considered as an issue (Khilji and Wang, 2006).

2.4.3.3 End-user layer

The last layer consists of end-users of ERPS who are directly involved in the usage of the information system, and therefore, empirical research at this layer can be of prime importance to acquire a comprehensive understanding of the usage process. In the context of Pakistan, the role of end-users can vary, for example, it can depend on the level of nepotism supporting the end-user (Mangi et al., 2012).

2.4.4 Factors proposed for the multi-level study of ERPS usage

This section presents the factors of ERPS usage that are selected to be explored in the current study. These factors have been selected on the basis of literature review and a consideration of the research questions which relates to the higher education sector. Moreover, the factors have been categorised into three layers, i.e. organisational, departmental and end-user layer. The factors found from literature for the current study are presented in Table 2.4, Table 2.5 and Table 2.6.

For this study, the factors to be studied at the top management layer i.e., organisational layer, are organisational culture, benefits realisation, human resource availability, tolerance for conflicts and risks, collegial support and collaboration, decision making and control, organisational alignment, training, and setting up learning structure. Table 2.4 presents the factors affecting ERPS usage at the organisational layer.

Table 2.4-ERPS usage proposed factors in HEIs at organisational layer

Factors	References
Organisational Culture	(Wejnert, 2002) (Bradford and Florin, 2003) (Islam, 2004) (Rajapakse and Seddon, 2005) (Ke and Wei, 2008) (Lee, 2010) (Haddara and Paivarinta, 2011) (Choudrie et al., 2012) (Waring and Skoumpopoulou, 2012) (Al-Zaabi et al., 2012) (Nada et al., 2012) (Waring and Skoumpopoulou, 2012)
Benefit Realisation	(Bradford and Florin, 2003) (Chou and Chang, 2008) (Park et al., 2007) (Liang et al., 2007) (Youngberg et al., 2009) (Schubert and Williams, 2009a) (Schubert and Williams, 2009b) (Williams and Schubert, 2010) (Haddara and Paivarinta, 2011)
Human Resource Availability	(Alcorta and Peres, 1998) (Chau and Tam, 2000) (Huda and Hussin, 2013) (Kahn et al., 2014)
Tolerance for Risks and Conflicts	(Ellen et al., 1991) (Bhatta, 2003) (Bradford and Florin, 2003) (Ke and Wei, 2008) (Lapiedra et al., 2011)
Collegial Support and Collaboration	(Rogers, 2003) (Bradford and Florin, 2003) (Park et al., 2007) (Ke and Wei, 2008) (Wang et al., 2008) (Huda and Hussin, 2013)
Decision Making and Control	(Bradford and Florin, 2003) (Cui et al., 2008) (Ke and Wei, 2008) (Wang et al., 2008) (Huda and Hussin, 2013)
Organisational Alignment	(Drury and Farhoomand, 1999) (Chou and Chang, 2008) (Huda and Hussin, 2013) (Parisi, 2013)

Factors	References
Training	(e.g., Bostrom et al., 1990) (Boudreau, 2003) (Bradford and Florin, 2003) (Ko et al., 2005) (Rajapakse and Seddon, 2005) (Khan et al., 2010)
Setting up Learning Structure	(e.g., Bostrom et al., 1990) (Attewell, 1992) (Oyelaran-Oyeyinka and Lal, 2006) (Ke and Wei, 2008) (Vega and Brown, 2011)

The factors selected to be examined at the departmental layer are operational support, managerial patience, active advocacy, management participation in ERPS learning sessions, management citizenship behaviour, power sharing, and performance based reward policy. The details are presented in Table 2.5.

Table 2.5-ERPS usage proposed factors in HEIs at departmental layer

Factors	References
Operational Support	(Bradford and Florin, 2003) (Ke and Wei, 2008) (Wang et al., 2008) (Haddara and Paivarinta, 2011) (Huda and Hussin, 2013)
Managerial Patience	(Ke and Wei, 2008) (Robertson et al., 2008) (Michaelis et al., 2010) (Ngwangwama et al., 2013) (Baporikar, 2016)
Active Advocacy	(Liang et al., 2007) (Ke and Wei, 2008)
Management Participation in ERPS Learning Sessions	(Bradford and Florin, 2003) (Rogers, 2003) (Ke and Wei, 2008)
Management Citizenship Behaviour	(Ke and Wei, 2008)
Power Sharing	(Hurley and Hult, 1998) (Ke and Wei, 2008)
Performance Based Reward Policy	(Ke and Wei, 2008) (Shields et al., 2015)

The factors chosen to be explored at the end-user layer are training, learning orientation, behavioural intentions, acceptance and usage of system, participation and support, resistance, ease of use, usefulness, motivation, and user satisfaction. The details are presented in Table 2.6.

Table 2.6-ERPS usage proposed factors in HEIs at end-user layer

Factors	References
Training	(e.g., Bostrom et al., 1990) (Boudreau, 2003) (Bradford and Florin, 2003) (Ko et al., 2005) (Rajapakse and Seddon, 2005) (Khan et al., 2010)
Learning Orientation	(Attewell, 1992) (Oyelaran-Oyeyinka and Lal, 2006) (Ke and Wei, 2008) (Vega and Brown, 2011)
Behavioural Intentions	(Fishbein and Ajzen, 1975) (Sheppard et al., 1988) (Ke and Wei, 2008) (Schubert and Williams, 2009b)
Acceptance and Usage of System	(Davis et al., 1989) (Liang et al., 2007) (Weerakkody et al., 2009)
Participation and Support	(Wang and Chen, 2006) (Walsham and Sahay, 2006) (Wang et al., 2008)
Resistance	(Davis et al., 1989) (Rogers, 2003) (Fowler and Gilfillan, 2003) (Rajapakse and Seddon, 2005) (Chou and Chang, 2008) (Wang et al., 2008) (Weerakkody et al., 2009) (Abbas, 2011) (Macfadyen and Dawson, 2012) (Waring and Skoumpopoulou, 2012)
Ease of Use	(Davis et al., 1989) (Macfadyen and Dawson, 2012)
Usefulness	(Davis et al., 1989) (Rogers, 2003) (Macfadyen and Dawson, 2012) (AlGhamdi et al., 2013)
Motivation	(Ke and Wei, 2008) (Schubert and Williams, 2009b)
User Satisfaction	(Doll and Torkzadeh (1988)

A visual illustration of the proposed factors of all three layers affecting ERPS usage in HEIs is presented in Figure 2.9.

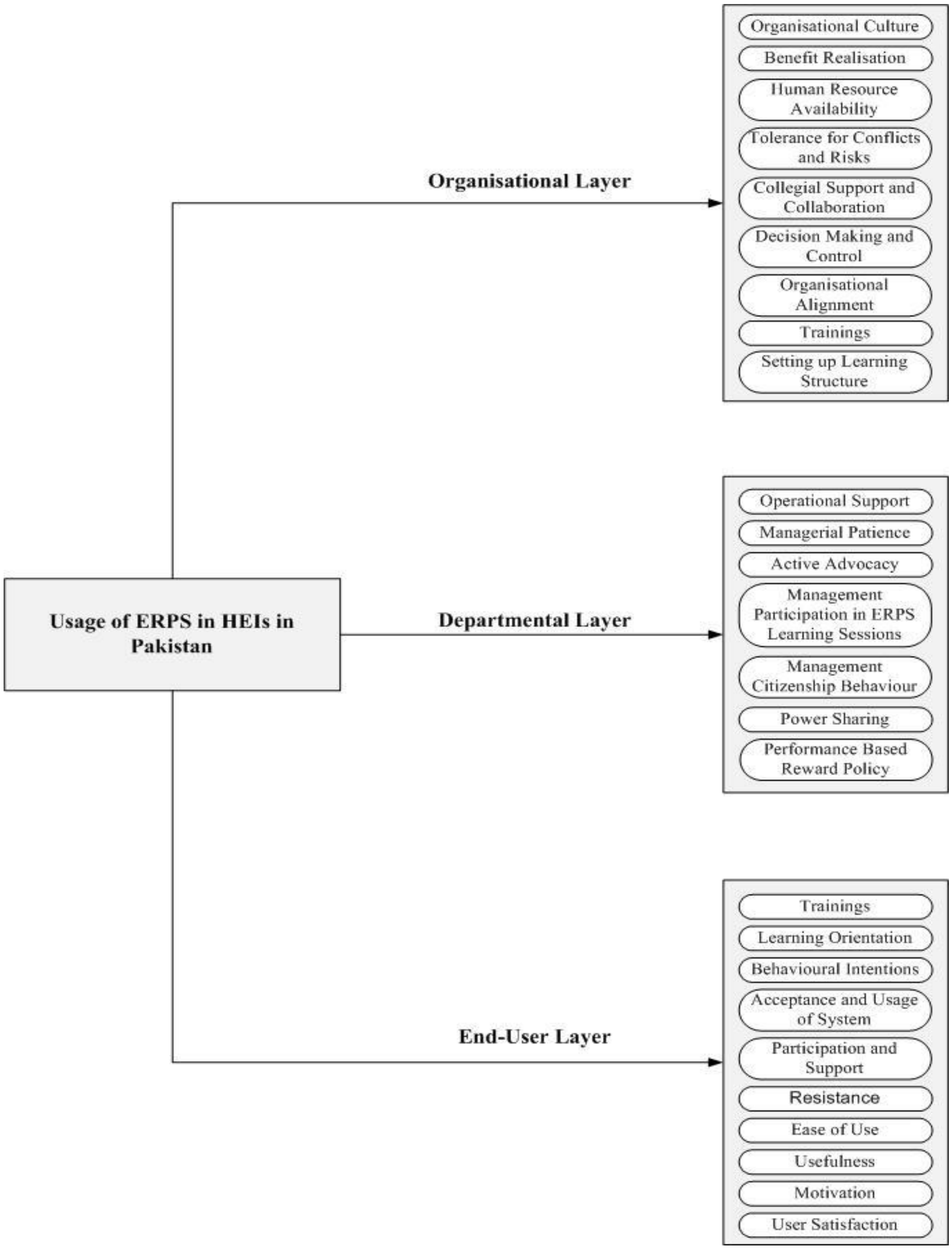

Figure 2.9-Proposed multi-layer factors of ERPS usage in HEIs

2.5 Research hypotheses

This section presents the constructs of factors proposed for this study. The hypotheses, based on the literature review, are constructed for each variable specific to each of the three layers, where Org, Dep and Eu refer to the organisational layer, the departmental layer and the end-user layer respectively.

2.5.1 Usage of ERPS factors at the organisational layer

The top most layer of an organisation is very important to take into consideration while investigating decision makings and impact of the decisions. Rogers (2003) suggested that organisational characteristics have influenced the successful implementation of innovations. Also, the literature has identified some important factors for usage of ERPS including cultural aspects, benefits to the organisation, risk issues, decision making etc. The nine factors selected for the organisational layer are discussed below.

2.5.1.1 Organisational culture

The implementation and utilisation of ERPS in an organisation are associated with risk and can have negative influences on the operations of the organisation (Waring and Skoumpopoulou, 2012). While the organisational culture has been asserted to be complex in itself, change in terms of adoption and implementation of ERPS can add to the complexity of organisational culture (Waring and Skoumpopoulou, 2012). This cultural complexity is also influenced by the ERPS and its various sub-systems presented into an organisation (Lee, 2010). Ke and Wei (2008) argues that implementation success of the sophisticated system is positively related to the positive culture of the organisation. Cultural change evolves over time after systems are implemented (Waring and Skoumpopoulou, 2012). The dimensions that play a vital role in the process are learning and development, participative decision making, power sharing, support and collaboration, risk tolerance and conflicts (Ke and Wei, 2008).

Researchers have also acknowledged the need to understand such systems by dividing organisation in three subsystems; organisation, technology and data (Lee, 2010). In additional to the role of technology, the organisational subsystem is also important. It refers to people and processes of the organisation. The implemented innovation systems can be observed as in a state of development and seen as a continuous process (Waring and Skoumpopoulou, 2012). With regards to ERPS usage, cultural change may be investigated along three dimensions i.e., integration, differentiation and fragmentation. It is argued that these three dimensions provide insight of cultural perspective of information technology, people and organisation as they are interconnected (Waring and Skoumpopoulou, 2012).

Hypothesis Org1: Organisational culture positively effects usage of ERPS at the organisational layer.

2.5.1.2 Benefit realisation

Investments in information systems require active management practices for benefits realisation. Research acknowledges that during the process of implementation of IS, organisations gain maturity and enrichment of culture for the acquisition of maximum benefits (Haddara and Paivarinta, 2011), however, maximising the benefits from the investment can be challenging. Research also identified that organisations may not necessarily achieve the desired benefits

(Williams and Schubert, 2010). Therefore, consideration of the potential negative outcomes and strategies to overcome the challenges is essential.

Investment in ERPS can be seen as beneficial and leading to more future investments (Haddara and Paivarinta, 2011). In certain conditions, benefits can be expected from system implementation and sometimes unanticipated benefits arise. Therefore, organisations may be assisted to identify, manage and actually realise the benefits of their ERPS investments (Williams and Schubert, 2010). In this case, the evolution of benefits over time and the nature of change arising from benefits realisation also requires consideration (Schubert and Williams, 2009a).

ERPS benefits can be classified into various categories, such as operational, managerial, strategic, infrastructure and organisational. It is argued that benefits realisation can be viewed in terms of the overall success of the information system. Another dimension is looking at benefits realisation in context and situational nature (Schubert and Williams, 2009b). Also, customization and organisational mechanism can bring business processes into alignment with best practices of ERPS for the actual realisation of benefits (Chou and Chang, 2008).

Hypothesis Org2: Benefit realisation will positively influence usage of ERPS at the organisational layer.

2.5.1.3 Human resource availability

The availability of the expert human resource in an organisation is critical for ERPS success. The training and skill development of end-users plays a key role. Information system expert users may play the role of informal trainers to end-users of the system and assist them in issues arising from the day to day operations of ERPS.

Hypothesis Org3: Expert human resource availability will positively influence usage of ERPS at the organisational layer.

2.5.1.4 Tolerance for conflicts and risks

The tolerance of the organisation for conflicts and risk-taking refers to the degree to which the organisation accepts conflicts and risk and proposes a solution to resolve such conflicts. Additionally, a culture of tolerance for risk allows innovative ideas to be tested for their effectiveness (Ke and Wei, 2008).

Hypothesis Org4: High tolerance for risks and conflicts will positively affect usage of ERPS at the organisational layer.

2.5.1.5 Collegial support and collaboration

A culture of collegial support and collaboration enables the end-users to cooperate with each other and prepares them to offer the help when needed. The organisation develops a culture where efficiency with accuracy is valued which serves to enhance the motivation of organisational members. It is argued that the motivation of employees to participate in the formal and informal training sessions may be enhanced by the appreciating them on effective use of the system (Ke and Wei, 2008).

Hypothesis Org5: High collegial support and collaboration will positively influence usage of ERPS at the organisational layer.

2.5.1.6 Decision making and control

With regards to ERPS, decision making and control refer to the extent to which an ERP project is able to meet established criteria pertaining to the following dimensions: make decision making processes more effective, intensify the controls of the organisation, and make decisions effectively (Wang et al., 2008).

Hypothesis Org6: Rational decision making and control will have a positive impact on usage of ERPS at the organisational layer.

2.5.1.7 Organisational alignment

The set of activities that aim at reducing uncertainty in an organisation during ERPS usage process is considered as organisational alignment. Addressing any uncertainty about task processing and environment can enhance the performance of an organisation by speeding up usage process. Organisational misfit, resistance and differentiation among sub-units can be reduced by applying strategies for organisational alignment (Chou and Chang, 2008).

Hypothesis Org7: Organisational alignment to gain performance will positively affect usage of ERPS at the organisational layer.

2.5.1.8 Training

Training plays a vital role in learning new technology. The role of management is to arrange extensive training for end-users, whether they are formal or informal (Boudreau, 2003). The emphasis on effective training and its contribution to the success of IS has been acknowledged in the literature (e.g., Bostrom et al., 1990).

Hypothesis Org8: ERPS training will positively influence usage of ERPS at the organisational layer.

2.5.1.9 Setting up learning structure

In addition to the factors hypothesised above, setting up a learning environment can affect the usage of ERPS. Bostrom (1990) asserts that learning structures reflect performance; both by itself and in a combination of training.

Hypothesis Org9: Setting up learning structure will positively influence usage of ERPS at the organisational layer.

2.5.2 Usage of ERPS factors at the departmental layer

Organisations are divided into semi-independent subunits to run the operations smoothly and efficiently. The departmental layer is middle layer of an organisation. The heads of departments can have a supervisory role for end-users of ERPS.

2.5.2.1 Operational support

Ke and Wei (2008) claims that the operational support of management is important in efficient usage of ERPS.

Hypothesis Dep1: High operational support will positively influence usage of ERPS at the departmental layer.

2.5.2.2 Managerial patience

The process of usage can be complex and pose challenges to the management. In addition to the support of management, effective absorption of technology can also be affected by managerial patience (Ke and Wei, 2008).

Hypothesis Dep2: High managerial patience will have a positive impact on usage of ERPS at the departmental layer.

2.5.2.3 Active advocacy

Through management’s active advocacy of the system that has been implemented, faster usage of the processes may be affected (Ke and Wei, 2008).

Hypothesis Dep3: Active advocacy for ERPS will positively affect usage of ERPS at the departmental layer.

2.5.2.4 Management participation in ERPS learning sessions

The participation of management in training sessions of ERPS can motivate end-users to actively participate in the sessions (Ke and Wei, 2008).

Hypothesis Dep4: Management participation in ERPS learning sessions will positively affect usage of ERPS at the departmental layer.

2.5.2.5 Management citizenship behaviour

Citizenship behaviour of management may be a key ingredient to foster the culture of tolerance (Ke and Wei, 2008).

Hypothesis Dep5: Management citizenship behaviour will have a positive influence on the usage of ERPS at the departmental layer.

2.5.2.6 Power sharing

Power sharing culture can stimulate the acceptance of ERPS. End-users develop the feeling of ownership of the information system when power is shared with them. The additional advantage of power sharing is that political activities are reduced within a functional unit (Ke and Wei, 2008).

Hypothesis Dep6: Power sharing will have a positive impact on usage of ERPS at the departmental layer.

2.5.2.7 Performance based reward policies

As Ke and Wei (2008) argue, formal or informal reward policies may be formed that are associated with the performance of the end-users in relation their usage of ERPS.

Hypothesis Dep7: Performance based reward policy for ERPS usage will positively influence usage of ERPS at the departmental layer.

2.5.3 Usage of ERPS factors at the end-user layer

The development of organisation-wide system requires input from end-users during pre-adoption and post-adoption phases to gain benefits out of the system implemented (Wang et al., 2008). In the case of complex systems such as ERPS, it becomes increasingly important to gain user support at the adoption phase. Involvement of end-user may impact potential resistance to the system as users own that system because of their involvement in the whole process (Wang et al., 2008). End-users are to be considered the most important layer for the success of ERPS in an organisation. This may particularly be valid for absorption or higher usage. The eleven factors identified for the end-user layer for usage of ERPS are hypothesised below.

2.5.3.1 Training

ERPS is seen as complex to learn and therefore, comprehensive training can be regarded as a requirement for its usage (Bradford and Florin, 2003). Adequate training can enhance the use of ERPS and increase the organisational performance.

Hypothesis Eu1: ERPS training will positively influence usage of ERPS at the end-user layer.

2.5.3.2 Learning orientation

The learning orientation of the end-user is crucial in the absorption process of ERPS. Self-motivation among the end-users can increase the pace of the usage process.

Hypothesis Eu2: Learning orientation positively affects the usage of ERPS at the end-user layer.

2.5.3.3 Behavioural intentions

Sheppard et al. (1988) presented TRA which addresses the determinants of behaviours of users. It explained that a person's performance of a specified behaviour is determined by the behavioural intention. Further, they described Attitude as positive or negative feelings of a person (Sheppard et al., 1988). Fishbein and Ajzen (1975) described the term subjective norm as a person's perception of how the important people surrounding him think about his behaviour.

Hypothesis Eu3: Behavioural intentions to the usage of the system will positively affect usage of ERPS at the end-user layer.

2.5.3.4 Acceptance and usage of system

Davis et al. (1989) proposed Technology Acceptance Model (TAM) that is an adaptation of TRA and focusing specifically on user acceptance of information systems. It provides a mechanism to measure the impact of external factors on internal attitudes, intentions and beliefs. TAM suggests that perceived usefulness and perceived ease of use are primarily related to computer acceptance behaviours. Perceived usefulness is user’s perception that using an innovative system may increase his performance at workplace. On the contrary, perceived ease of use is the perception of the user about the system to be ease of use (Davis et al., 1989).

Hypothesis Eu4: High acceptance and usage of the system will positively affect usage of ERPS at the end-user layer.

2.5.3.5 Participation and support

User support refers to the psychological state of participation of the representatives of organisational members in the process of innovation. Lack of user support is considered as a major challenge to the success of ERPS (Wang and Chen, 2006). Notably, if the users are not psychologically ready to change themselves to accept ERPS, there can be resistance to the use of ERPS, therefore, earning the support of users is crucial (Wang et al., 2008).

Hypothesis Eu5: High Participation and support will positively influence usage of ERPS at the end-user layer.

2.5.3.6 Resistance

The culture of HEIs is acknowledged as resisting to change (Macfadyen and Dawson, 2012); where the resistance can be lowered through various techniques, including motivation of the staff by the operational in-charges (2011) or application of strategies for organisational alignment (Chou and Chang, 2008).

Hypothesis Eu6: High resistance will negatively affect usage of ERPS at the end-user layer.

2.5.3.7 Ease of use

Davis et al. (1989) suggest that ease of use is primarily related with computer acceptance behaviours. Ease of use is the assessment of user about the level of complexity of the system.

Hypothesis Eu7: High ease of use will positively influence usage of ERPS at the end-user layer.

2.5.3.8 Usefulness

Perceived usefulness is user’s perception that using an innovative system may increase his performance at workplace (Davis et al., 1989).

Hypothesis Eu8: Perceived usefulness positively impacts on the usage of ERPS at the end-user layer.

2.5.3.9 Motivation

A possible reason for the failure of information systems is the lack of engagement of end-users. An organisation may take measures to motivate the end-users. It is stated that the motivation of employees to be a part of formal and informal training sessions may be enhanced by appreciating them for effective use of the system (Ke and Wei, 2008).

Hypothesis Eu9: Higher motivation will have a positive impact on usage of ERPS at the end-user layer.

2.5.3.10 User satisfaction

Doll and Torkzadeh (1988) claim that end-user satisfaction is the attitude of end-users towards a computer application or system that is in use in the organisation. They further explain that end-user is defined as the person who interacts directly with computer software.

Hypothesis Eu10: Higher user satisfaction will have a positive impact on usage of ERPS at the end-user layer.

2.6 The conceptual model

This section presents the factors of ERPS usage that are examined in this study. These factors are selected on the basis of the literature review as discussed in the previous section and a consideration of the research questions. These factors are categorised into three layers, i.e., organisational, departmental and end-user layer. Factors specific to the organisational layer are organisational culture, benefits realisation, human resource availability, tolerance for conflicts and risks, collegial support and collaboration, decision making and control, organisational alignment, training, and setting up learning structure. Factors specific to the departmental layer are operational support, managerial patience, active advocacy, management participation in ERPS learning sessions, management citizenship behaviour, power sharing, and performance based reward policy. Finally, factors specific to the end-user layer are training, learning orientation, behavioural intentions, acceptance and usage of system, participation and support, resistance, ease of use, usefulness, motivation, and user satisfaction.

Building upon the above discussion, a conceptual model is developed for this study. First, it proposes an examination of usage of ERPS across three major layers, i.e., organisational, departmental and end-user which is in line with the multi-level approach for identifying factors of usage of ERPS. Secondly, the model identifies specific factors for each of the three layers that are tested in the form of research hypotheses. The factors of usage at the organisational level are organisational culture, human resource availability, tolerance for risks and conflicts, collegial support and collaboration, decision making and control, organisational alignment, training, benefits realisation and setting up learning structure. The factors of usage of ERPS at departmental level are operational support, managerial patience, active advocacy, management participation in ERPS learning sessions, management citizenship behaviour, power sharing and performance-based reward policy. Finally, the factors of usage at the end-user level are absorptive capacity, training, learning orientation, behavioural intentions, acceptance and usage of system, participation and support, resistance, ease of use, usefulness, motivation and user satisfaction.

The conceptual model developed for this study is shown in Figure 2.10, which offers a multi-level examination of the usage of ERPS across three layers, i.e., organisational, departmental and end-user in HEIs in Pakistan. Secondly, the model identifies specific factors for each of the three layers, as per the research questions provided above. Moreover, the relationship of demographic factors at all three layers, namely; age, gender, educational qualification, experience in HEI, experience with ERPS are also proposed. Finally, the usage of ERPS at all the three layers is suggested to lead to the usage of ERPS in HEIs.

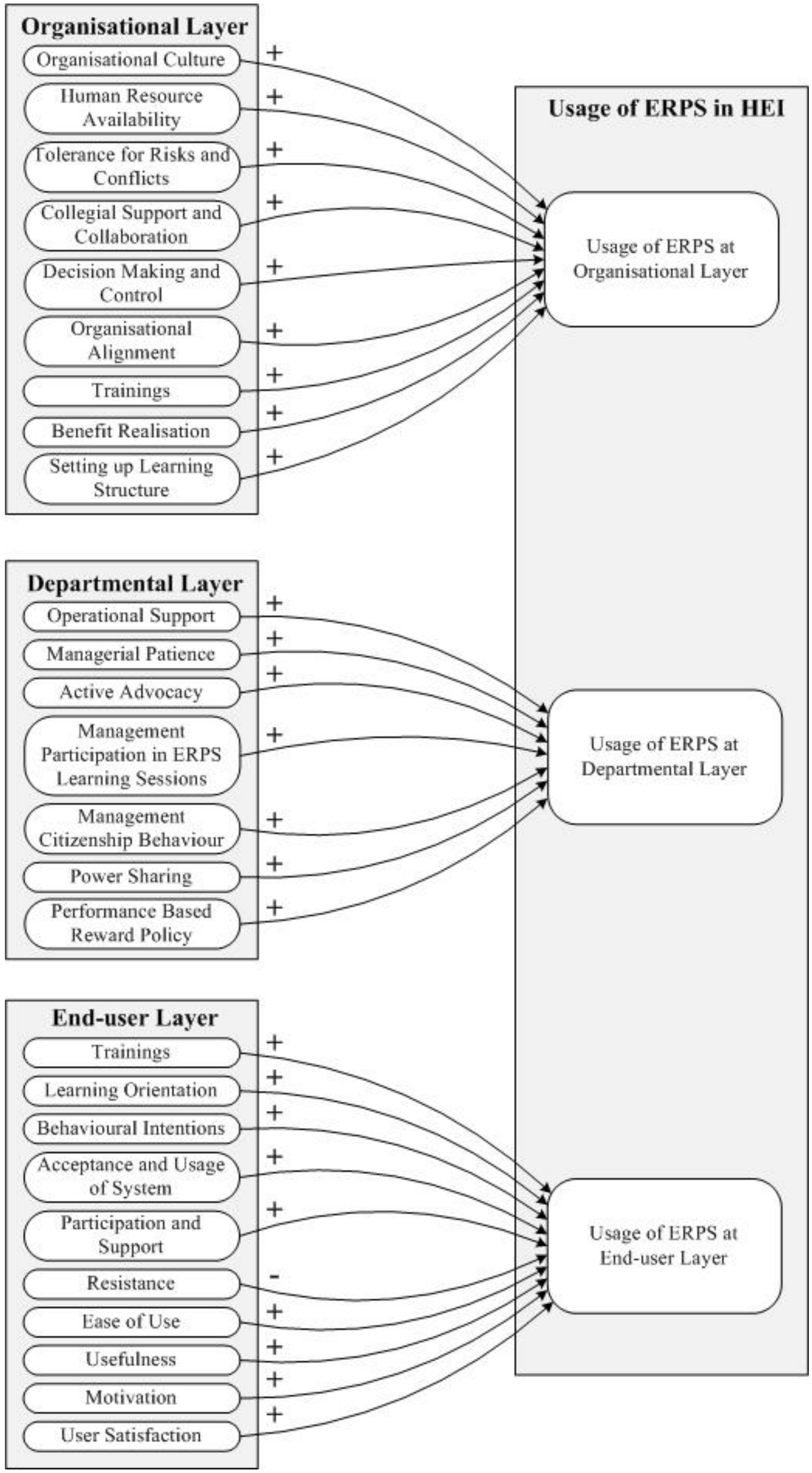

Figure 2.10-Conceptual model for usage of ERPS in HEIs

The research methodology presented in next chapter is coherent with the conceptual model presented here. Although the details of the methodology are provided later, it is clarified here that three distinct questionnaires have been designed for each of the three layers presented in the conceptual model The Organisational layer survey uses Questionnaire-Organisational Layer (Q-Org), the departmental layer survey uses Questionnaire-Departmental Layer (Q-Dep) and Questionnaire-End-user Layer (Q-Eu) is used for the end-user layer. All the three questionnaires are positioned in Appendix E.

2.7 Summary

This chapter presented a comprehensive literature review of ERPS and ERPS usage in HEIs. Furthermore, it has explained the multi-level approach to the usage of ERPS at organisational, departmental and end-user layers. The theoretical framework is discussed in detail to identify the factors affecting usage of ERPS in corporate sector and higher education sector. Further, the conceptual model is presented followed by the hypotheses proposed. The next chapter presents research methodology for this study.

Chapter 3. Research Methodology and Methods

3.1 Introduction

Research methodology refers to the rationale of the selection of the research philosophy and research methods. The methodology used in this study is based on the existing and established methodologies in IS research (Henfridsson et al., 2011). Quantitative research is used in the current study, as it is suited to provide information in breadth, acquire and analyse numerical data, to predict factors, to test hypotheses based on the existing theory and to examine the cause and effect relationships (Muijs, 2010). Pinsonneault and Kraemer (1993) suggest that surveys in IS research are used to provide standardised quantitative descriptions of the sample based on structured questions, to examine relationships between variables, and to allow generalisation of the information obtained from a sample. Surveys are an appropriate method when the research questions are about what, how many etc. (Pinsonneault and Kraemer, 1993). The existing IS literature also widely relies on survey research, for example, it is used in 41 percent of the publications reviewed by Chen and Hirschheim (2004). Also, the large amount of data from a sizeable population can be acquired at minimal cost (Bryman and Bell, 2007).

Three distinct questionnaires have been designed for each of the three layers presented in the conceptual model. The organisational layer survey uses Questionnaire-Organisational Layer (Q-Org), the departmental layer survey uses Questionnaire-Departmental Layer (Q-Dep) and Questionnaire-End-user Layer (Q-Eu) is used for the end-user layer. This study employs a survey-based research (Yin, 2009) which is in accordance with the international inclination of research in information systems (Benbasat et al., 1987, Pinsonneault and Kraemer, 1993).

Researchers have noticed that it can be challenging to gain access to the organisation (e.g. Darke et al., 1998). Also, the choice of data collection method affects the overall quality of the study (Pinsonneault and Kraemer, 1993). Although empirical evidence in this study is collected from a single sector i.e. the higher education sector; however, within this sector, various higher education institutions are examined. This section discusses the population, sample and the procedures for using the questionnaire as the main research instrument for primary data collection.

Population, or universe, refers to the whole mass of the study (Mehta, 2010). The population of the study comprises of all HEIs using ERPS in Pakistan to which the study may be generalised (HEC Pakistan, 2012b). Parallel to the multi-layer focus of this research, a multi-level sample is utilised in this research project (Arber, 2001, De Vaus, 2002, Robson, 2002). At the first broadest level, Pakistan is selected as the geographical unit of analysis for this study. Secondly, higher education section is chosen as the research on the usage of ERPS is scarce in this sector. Moreover, researcher's academic experience of over 12 years in the largest HEI in Pakistan has proved helpful in gaining access to the respondents. Further, specific HEIs in Pakistan are selected according to the information about ERPS provided in the annual reports available on HEC website. In this regard, identifying usable information from the poorly-designed websites of HEIs in Pakistan is a challenge (Abbasi et al., 2012). HEIs that are using ERPS fulfilled the criteria of the required sample for the study. With regards to access, the researcher has relied on a strong network with those in power to get access to the respondents as well as the external and internal documents and publications. Both self-administered, as well as researcher-administered paper-based questionnaires, are used to get a higher response rate (Saunders et al., 2011). Table 3.1 shows the list of HEIs that are visited for the data collection.

Table 3.1-HEIs selected for the study

HEI ID	Higher Education Institutions	City	Sector	ERPS Name
1	University of the Punjab	Lahore	Public	Campus Management System
2	Quaid-e-Azam University	Islamabad	Public	Campus Management System
3	Islamia University	Bahawalpur	Public	Campus Management System
4	COMSATS	Sahiwal	Public	CUONLINE
5	COMSATS	Vehari	Public	CUONLINE
6	COMSATS	Islamabad	Public	CUONLINE
7	COMSATS	Wah	Public	CUONLINE
8	COMSATS	Abbottabad	Public	CUONLINE
9	COMSATS	Attock	Public	CUONLINE
10	COMSATS	Lahore	Public	CUONLINE
11	University of Central Punjab	Lahore	Private	University Management System
12	SZABIST	Islamabad	Private	University Management System
13	University of Lahore	Lahore	Private	Student Management System
14	Bahria University	Islamabad	Private	University Management System
15	Iqra University	Islamabad	Private	University Management System
16	Agriculture University	Faisalabad	Public	Learning Management System
17	Government College University	Faisalabad	Public	Campus Management System
18	National Textile University	Faisalabad	Public	Campus Management System

3.2 Research methodology

The research methodology is defined in Section 3.1. Quantitative research has been used in the current study. Surveys in information systems have been used to provide standardised quantitative descriptions of the sample based on structured questions, examine relationships between variables, and to allow generalisation of the information obtained from a sample (Pinsonneault and Kraemer, 1993). As such, the methodological choices are aligned with the purpose of the research.

3.2.1 Research philosophy: post-positivism

The researcher holds a post-positivist philosophy based on the premise that although research cannot fully uncover reality, it can be approximated through reliable and generalizable findings. This section describes and justifies the ontological, epistemological and axiological stance assumed in this study.

Positivism has been popularly used by IS researchers, for example, an older review of research publications showed that 96.8% used positivist paradigm (Orlikowski and Baroudi, 1991), and even comparatively recent researchers have indicated the domination of positivism in IS research (Goles and Hirschheim, 2000). The positivism stream of IS research is based on the evidence that reality is objective, independent of the researcher and can be measured through quantitative data, for example, through surveys (Orlikowski and Baroudi, 1991). Some researchers have critiqued positivist paradigm for its limitations in capturing subjective phenomenon, and interpretivism seems to be gaining popularity along with the rise of mixed-methods studies (Chen and Hirschheim, 2004). Essentially, post-positivism has gained less attention of IS researchers. As the purpose of the study is to collect quantifiable data to test the hypothesis with the assumption that the reality (which is objective and external to the researcher) may be approximated and generalised, therefore, the post-positivist paradigm is considered suitable for the considered study.

3.2.2 Ontological assumptions

Ontology is concerned with the nature of reality, specifically, the components or constitutes of reality and the interaction of such components. It also refers to the claims that the selected paradigm, i.e. quantitative paradigm makes about reality or truth, which can, in turn, affect the methods of inquiry undertaken in the research study. The ontological stance of the inquirer held in this study is that of realism, according to which there is a possibility of an objective reality out there (Muijs, 2010), and that the existence of this visible mind is independent of the researcher(Saunders et al., 2011). This reality is examined through numerical and measurable data through strict objective measures which are not supposed to be influenced by the researcher's perception of the reality. Further, in line with the post-positivist paradigm, the researcher believes that the reality can only be known "imperfectly and probabilistically" (Robson, 2002). As such, as a realist, the researcher acquired an approximation of the reality through this study. These ontological assumptions have impacted the topic selection, generation of research questions as well as the methods for data collection and analysis.

3.2.3 Epistemological assumptions

Epistemology is concerned with the nature of knowledge, specifically, the relationship of the researcher with what is being researched (Saunders et al., 2011). The epistemological position of the inquirer for the current study holds that objective and systematic knowledge of the reality can be acquired through hypotheses testing. However, absolute distinction between the researcher and the subject of the investigation is ideal (Mack, 2010). Therefore, with a post-positivist paradigm, the researcher conducted research objectively, provided accurate explanations of the real world and explicated the philosophical claims and assumptions. It is also held that the knowledge acquired from one research project can be generalizable to other situations (Gall et al., 2003).

3.2.4 Axiological assumptions

The axiological assumption is that the research may be conducted with minimum effect of personal values of the researcher (Mack, 2010). The researcher has been working as a faculty member in the largest HEI of Pakistan since 2002, therefore, it may be argued that personal bias of the culture and usage practices of ERPS in higher education sector may exist to an extent. However, this study follows an objective ontology, in which the researcher is separated from the context. This type of research is value free, where the researcher cannot use his personal bias over the data or interpretation of the results (Saunders et al., 2011).

3.2.5 Research approach: deduction

The methodology to meet the research objectives can be contributed or limited by the research approach (Saunders et al., 2011). This study uses a deductive approach to collect and analyse quantitative data, where research usually starts with hypotheses and then data is collected to test the hypotheses (Bryman and Bell, 2007). Within post-positivism, a deductive approach can be used to test existing theory or hypotheses subject to rigorous test with the purpose of generalisation (Saunders et al., 2011). Because of the need to generalise the findings of the research, sampling techniques and sample size are crucial in deductive approach. Deductive research can have the sequential stages of deducing a hypothesis based on literature review, operationalizing the hypotheses that can be measured, testing the hypotheses, examining the specific outcome and using the findings to modify the existing theory (Robson, 2002, Al-Zaabi, 2013).

3.2.6 Research strategy

The existing IS literature has widely relied on survey research, for example, it is used in 41 percent of the publications reviewed by Chen and Hirschheim (2004). This study uses a survey research as it is primarily considered as a quantitative method to require standardised information, at any level, including organisational, departmental and individual level (Pinsonneault and Kraemer, 1993). The selection of survey strategy fits well with the deductive approach as suggested earlier (Saunders et al., 2011). Also, the large amount of data from a sizeable population can be acquired at minimal cost (Bryman and Bell, 2007).

In Chapter 2, Layder's (1993) research map is adapted as a conceptual tool where the organisational, departmental and end-user layers are seen as distinct, yet interwoven and overlapping layers. This section extends the research map to accommodate the research methods in order to maintain an alignment between the research objectives, conceptual framework and the research methods (Bryman and Bell, 2007, Layder, 2012, Saunders et al., 2011, Yin, 2009). As shown in Figure 3.1 and explained in detail below, the three layers; the organisational, the departmental and the end-user; have unique but interlinked focus and objectives, therefore, three distinct questionnaires are used for each of these three layers. Figure 3.1 presents the extended research map.

	Research Elements	Description	Research Focus	Research Objective	Research Methods
USAGE OF ERPS	**Context**	Macro social forms	Higher Education Industry of Pakistan	To set the factors contributing to usage of ERPS in the industrial context	- Systematic Literature Review - Official statistics and reports related to ERPS - National data
	Setting	Immediate environment of social activity	Higher Education Institutes	To examine the factors contributing to usage of ERPS in HEI at the Organisational Layer	- Systematic Literature Review - Official statistics and reports related to ERPS - Questionnaire-Org
	Situated Activity	Dynamics of face-to-face interaction	Departments of HEIs	To examine the factors contributing to usage of ERPS in HEI at the Departmental Layer	- Systematic Literature Review - Official statistics and reports related to ERPS - Questionnaire-Dep
	Self	Biographical experience and social involvements	End-Users in HEIs	To examine the factors contributing to usage of ERPS in HEI at the End-User Layer	- Systematic Literature Review - Official statistics and reports related to ERPS - Questionnaire-EU

Figure 3.1-Research resource map extended (Adapted from Layder, 1993, p.114)

3.2.7 Time horizon

A cross-sectional survey collects data to make inferences about a population of interest at one point in time (Bryman and Bell, 2007). This study adopts a cross-sectional approach in which data represents information acquired at a specific point in time (Balnaves and Caputi, 2001). Further, it uses multiple cross-sectional snapshots in which data is collected from various research settings (Chen and Hirschheim, 2004).

3.3 Research methods

3.3.1 Selection of quantitative methods

After considering factors and aims of the current study, quantitative research design is justified to be an appropriate type of research because the purpose of this study, type of the data, research approach and the nature of procedure are closely matching with the above-stated characteristics of the quantitative research. Further, the research questions formulated for the study also necessitates the collection of data through a survey instrument. In addition, the study tests the hypotheses related to the relationships proposed in the model of the study requires the use of inferential statistics, which corresponds to the quantitative analysis. Thus, keeping in view the research questions and hypotheses of the study, quantitative research design using survey methodology is found to be most appropriate and is used in the current study.

3.3.2 Quantitative analysis methods

Data analysis is aimed at finding the answers to research questions mentioned in chapter one. This section is based on statistical analysis to check all hypotheses. As quantitative methodology is selected for this study, statistical analysis is suggested to be executed using Microsoft Excel, IBM SPSS and R. These statistical tools are reliable and extensively used in social science research. This research is based on causal relations among variables in which the relationship between independent and dependent variables have been investigated. It is a cross-sectional research as the data is gathered within a specified time period. Cross-sectional study is believed to be suitable here since, in this study, the researcher explored the relationship based on causal relations (Sekaran and Bougie, 2011).

3.3.2.1 Descriptive Statistics

In order to organise and explain the data, the researcher used descriptive statistics. For this purpose, frequency distribution, mean, percentages and standard deviation are used to arrange the data and to prepare it for further analysis. The descriptive data is also used to ascertain the variability and consistency of data for reliability.

3.3.2.2 Correlation

Correlation coefficient describes the strength of association between two variables. In the present study, the variables involved are analysed using correlation to ascertain the strength of the relationships.

3.3.2.3 Regression Analysis

Regression analysis is used to investigate the influence of the independent variables on ERPS usage. Regression analysis is used for investigating the influence or impact of independent variables on the dependent variable. Generally, a multiple regression model is presented in Equation 2.1.

$$Y = \alpha + \beta_1 X_1 + \beta_2 X_2 + \ldots\ldots + \beta_n X_n + \varepsilon$$

Equation 2.1-Regression equation

Where,

Y = Dependent variable, also known as criterion variable

α = Intercept also known as constant

β_n = regression coefficient

X_n = independent variable is also known as predictive variable

ε = error term (the difference between actual and predicted values in the regression model assuming that residual will have normality, linearity, homoscedasticity and independence).

3.3.2.4 Structural equation modelling

The regression analysis is the first generation multivariate statistical analysis technique; it predicts the dependent variable on the basis of change in the independent variables. The next generation multivariate statistical analysis technique is structural equation modelling, to further investigate the effect of the selected factors on the dependent variable. SEM is better technique as compared to the traditional techniques which are generally inflexible. SEM provides the liberty to specify customised models (Suhr, 2006). SEM uses question items to calculate the model fit indicators, statistics of factor loadings, regression coefficients and error terms etc. In comparison, multiple linear regression analysis uses the mean values of the factors to calculate the statistics. Another reason of choosing SEM in current research is the ability of evaluating model construct relationships (Alavifar et al., 2012). To explain it further, SEM is a superior technique as compared to first generation techniques such as regression, model relationships and construct relationships as these are performed separately while SEM addresses model evaluation, construct relationships, measurement error and model error concurrently.

3.4 Questionnaires development

Three distinct structured questionnaires are designed; one for every layer. These three questionnaires address the relevant factors identified to be investigated from top management, departmental management and end-users. Factors chose and relationships theorised for study are listed in the conceptual framework. The questionnaires are expected to take between 15 to 20 minutes for each of the three questionnaires, with Q-Org consisting of ten variables and 54 items, Q-Dep consisting of eight variables and 34 items and Q-Eu consisting of eleven variables and 48 items. The design of the questionnaires is aligned with the optimal length of questionnaire suggested by established researchers (Balnaves and Caputi, 2001).

Firstly, at the organisational layer, the potential respondents are high officials and policy makers. In consideration of the very small population size of the top level management of HEIs, the number of respondents at this layer is small for Q-Org.

Secondly, Q-Dep refers to the questionnaire at the departmental layer. Respondents of Q-Dep include administrative in-charges of academic units of HEIs that are responsible for usage of ERPS within the particular unit of which they are in-charge. A relatively higher number of responses are recorded at this level as compared to the top management layer.

Thirdly, Q-Eu is used to collect data from end-users of ERPS. This layer is having two types of respondents; faculty members and employees. As compared to the above two levels, the numbers of respondents are larger than respondents of Q-Org and Q-Dep.

To empirically test the conceptual model outlined in Figure 2.10, three questionnaires are developed as stated briefly above. The first questionnaire is designated to take the responses from the organisational layer. Organisational layer constitutes the deans of the faculties and officials who are working at the top administrative positions for ERPS policy making in HEIs. It is stated that organisational culture, human resource availability, collegial support and collaboration, decision making and control, organisational alignment, training and benefits realisation influence the usage of ERPS at the organisational level. The second questionnaire is designed to measure the effects of factors that explain usage at the departmental layer. Considering that there are three layers in the HEIs, the middle layer is the departmental layer. The departmental layer consists of faculty members working as departmental heads at HEIs. The heads of the departments are also acting as the line managers of the end-users and end-users are directly reporting to the respondents of departmental layer. Factors that are the determinants of usage at the departmental level are operational support, managerial patience, management participation in ERPS learning sessions, active advocacy, management citizenship behaviour, power sharing and performance-based reward policy. The third questionnaire is structured to investigate the usage of ERPS at the end-user level. End-users are the administrative staff and faculty members who are the users of ERPS at the HEIs. Factors that are explaining variation in the usage at end-user layer included training, learning orientation, acceptance and usage of the system, participation and support, resistance, ease of use, usefulness and user satisfaction. The three questionnaires are sent to the experts for review and technical feedback. The suggestions of the experts are incorporated to improve the three questionnaires including the refinement of statements of questions. Further, the three questionnaires are pre-tested using pilot data and refined before the full data collection.

In three questionnaires designed, only close ended questions are included that are measured on the likert scale. The open ended questions are not included as this study is mainly quantitative and the focus of this study is to get the country wide data of the ERPS usage in HEIs. The research instrument is based on a five-point Likert scale for the data collection. Over the years, advocates of Likert scale tried to find a best possible number of point options for the respondents. However, each number has its own strengths and weakness (Matell and Jacoby, 1971). Recent studies on the Likert scale show that the optimal option for Likert scale is five points. In comparison with seven points Likert scale, which provides a variety of options but difficult for the respondents to differentiate between option whereas 3 points Likert scale does not provide appropriate freedom for choice (Boone and Boone, 2012, Li, 2013). Dawes (2008) conducted a study to compare five points, seven points and ten-point Likert scales. The result of the study suggested that five-point Likert scale provided better results as compared to the seven and ten-point Likert scale. Thus, the current study is using five-point Likert scale for the data collection on the recommendations of recent researchers.

The design of the questionnaire follows the method of Dillman (1978), which includes a cover letter, an instruction sheet and the survey instrument. The cover letter contains the introduction, purpose of research, anonymity and information handling, researcher's name, address, signature, institution, date and contact details. The self-administered questionnaire consists of two main sections. The first part of the questionnaire consists of demographic profiles of the respondents including gender, age group, education, total work experience, total experience in HEIs, experience in current HEI and experience dealing with ERPS. The second part of the questionnaire obtains the perceptions of the respondents regarding the variables of the relevant layer of the study.

3.4.1 Principles of questionnaire design

The basic principles of questionnaire design are followed in the designing of the three questionnaires for the organisational, the departmental and the end-user layers. The main point include considering that the items are not too long and respondents can read them easily and quickly. The contents are clear simple and unambiguous. Also, the items contain a single idea and are sufficiently definitive. Further, it is also considered to use mix of positive worded questions and negative worded question to avoid positional bias. Furthermore, the items mean the same to all group of informants (Sapsford, 2006).

3.4.2 Operationalisation of variables

As mentioned above, the current study investigates the determinants of the effective ERPS usage at organisational layer, departmental layer and end-user layer. For the determinants of the organisational layer, organisational culture is operationalized on the basis of six items. These items are used to measure the degree to which policies and procedures of HEI support the effective usage of ERPS. The second factor at organisational layer is human resource availability. This factor is measured by six items used to tap the availability of the technical skills, capability and willingness of technical human resources to implement effective ERPS. Next factor is tolerance for risks and conflicts for ERPS. This factor is measured through six items and is operationalized as the degree of top management readiness to support and tolerate the difficulties and conflicts arise for effective implementation of the ERPS. Collegial support and collaboration are operationalized through four items used to tap the collaboration and support between the entities using ERPS in the HEI. Decision making and control refers to the degree of organisational control and effective decision making about ERPS usage. This is measured on the basis of nine question items. Organisational alignment refers to the capability of the ERPS to meet objectives of HEI; four question items are used for the purpose. The factor of training is operationalised using seven items and refers to the level of training provided in the HEI for effective usage of ERPS. Benefit realisation refers to the degree to which the ERPS is considered beneficial for the HEI, consisting of six question items and setting up learning structure for ERPS is measured through five items and is operationalised as measuring the degree of the learning environment to incorporate the challenged posted by ERPS.

The second layer for the ERPS usage in HEIs is a department. Factors that are assumed to be determinants of usage at the departmental level are operational support, managerial patience, management participation in ERPS learning sessions, active advocacy, managerial citizenship behaviour, power sharing and performance-based reward policy. Organisational support is operationalized on the basis of four items used to tap the level of perceived organisational support provided by the HEI to the department in order to effective utilisation of the ERPS. Managerial patience is operationalized on the basis of five items. These items are used to measure the level of management support, motivation and patience to enhance the usage of ERPS at the department level. Active advocacy refers to the promotional activities of the departmental managers in order to enhance ERPS usage. This is measured on the basis of five items. Management participation in ERPS learning sessions refers to the involvement of the departmental heads in ERPS learning activities consisting of four items. Managerial citizenship behaviour refers to the level of extra role activities of departmental heads to enhance ERPS usage. Six questions are used to measure the concept. Power sharing refers to the delegation of the authority to the employees regarding ERPS consisting of five items. Performance based reward policy refers to the degree to which rewards are based on the usage of ERPS. This is measured on the basis of five items.

The third layer of the ERPS usage in this study is an end-user layer. Factors that are assumed to be explaining variation in the usage at end-user layer include training, learning orientation, behavioural intentions, acceptance and usage of the system, participation and support, resistance, ease of use, usefulness, motivation and user satisfaction. Training is operationalized on the basis of eight items related to the training and development activities provided by the university to the staff for ERPS usage. Learning orientation refers to the self-motivation and ability to learn new skills. This is measured using five question items. Behaviour intentions refer to the willingness to continue using ERPS consisting of four items. Acceptance and usage of the system is measured using three items and refers to the response of users to ERPS acceptability and using ERPS in daily routine. Participation and support are operationalized on the basis of six items, refers to the participation and support provided by the management to the staff in order to use ERPS. Resistance consists of four items. This is measuring the element of resistance to the usage of ERPS and converting daily tasks from manual to an automated process. Ease of use is operationalized on the basis of four items used to identify the level of complexity of the ERPS for the end-user. Usefulness refers to the perceived usefulness of the ERPS for the end-user. This is measured with three items. Motivation refers to the degree of self-engagement in the ERPS usage and user satisfaction refers to the degree of satisfaction of the end user with ERPS. Both concepts are measured using five items each.

3.5 Data collection

Researchers have noticed that it can be difficult to gain access to the organisation (e.g. Darke *et al.*, 1998). Also, the choice of data collection method affects the overall quality of the study (Pinsonneault and Kraemer, 1993). This section discusses the population, sample and the procedures for using the questionnaire as the main research instrument for primary data collection.

3.5.1 Population and sampling

Population, or universe, refers to the whole mass of the study (Mehta, 2010) while the sample is a selection or a subset of a population (De Vaus, 2002, Robson, 2002). The sampling method applied in this study is multi-stage sampling. It is pertinent to mention that random sampling is not utilised in this study. At the first broadest level, Pakistan is selected as the geographical unit of analysis. As already discussed above, research on the usage of ERPS in Pakistan is scarce; and it is also the researcher's home country. At the second level, the higher education sector in Pakistan is selected on the basis of purpose and convenience: the under-researched HEIs in Pakistan as well as the researcher's academic experience of the past 12 years in largest HEI in Pakistan. Thirdly, a number of HEIs in Pakistan are selected using ERPS, according to information provided in the annual reports on HEC website and other public sources. HEIs that are using ERPS meet the criteria to be included in the population. Lastly, personal contacts are utilised to approach the potential respondents for the three survey questionnaires.

The total number of HEIs in Pakistan that is 135 (HEC Pakistan, 2012b). Total number of HEIs using ERPS in Pakistan are 24, considered as population for the study. Due to terrorism in few cities of like Pakistan, Peshawar, Karachi and Quetta (Malik and Zaman, 2013), respondents of the HEIs working in the cities affected by terrorism are not included in primary data collection. Out of the population, six HEIs are located in the areas that are affected by terrorism, therefore it is not practical to study all the HEIs in the population, and a sample is to be selected (VanderStoep and Johnson, 2008). 18 HEIs are selected for this study located in nine cities of Pakistan. This makes 75 percent of the total HEIs using ERPS in Pakistan.

The size of the sample is to be adequate so as to generalise the findings of the study (Saunders et al., 2011) and to answer the research questions (Gorard, 2003). In general, the minimum sample size is thirty cases for survey research (Kothari, 2004).

Parallel to the multilevel focus of this research, a multilevel sample is utilised in this research project (Arber, 2001). The first questionnaire, Q-Org, is used to collect information from the top management persons that play the key role of policy makers. The second questionnaire, Q-Dep, is used to collect information from the departmental heads. The third questionnaire, Q-Eu, is used to collect information from end-users. The letters from the HEIs selected for the study are obtained before starting the data collection to ensure the institution's permission and support to the researcher for primary data collection. The researcher's personal contacts in HEIs facilitated the process of accessing respondents for the questionnaires.

3.5.2 Access

Researchers have cautioned against the weak research culture in Pakistan (Shamim and Qureshi, 2010) and that research is usually considered a waste of time by the management (Ayub and Jehn, 2010). Therefore, in accordance with the culture of nepotism in Pakistan (Islam, 2004), the researcher had to rely on a strong network with those in power (Ayub and Jehn, 2010) to gain access to the respondents. Letters from HEIs were obtained to ensure the institution's permission and support to the researcher for primary data collection. Additionally, the researcher's personal contacts in HEIs also facilitated the process of meeting the respondents for the questionnaire.

Researchers consider the use of internet-based survey for collecting primary data as easy and cost effective. Online surveys are advantageous in terms of the fast, affordable and effective data collection from a large sample (Andrews et al., 2003, Bethlehem and Biffignandi, 2011). However, for this study, the online survey is not a feasible method in line with the weak research culture of Pakistan. The higher response rate is achieved by personal visits of the researcher to the HEIs as compared to an average response rate of using the postal and online questionnaires. The researcher delivered the questionnaire to the respondents of all HEIs in person and also collected the filled questionnaire. This gave a chance to meet respondents in person, introduced them to the purpose of research and anonymity is emphasised (Saunders et al., 2011).

3.5.3 Pilot test

The data collection for the pilot test is conducted first using three survey questionnaires prior to the full data collection. Based on findings from the pilot study, the arising aspects are used to refine the research instruments (Bryman and Bell, 2007, Saunders et al., 2011, VanderStoep and Johnson, 2008).

3.6 Questionnaires validation

Validity describes the level of accuracy of any measurement scale. This implies that a valid instrument is one which measures what it is supposed to measure. Construct and content validity of the measurement instrument are very much important for generalizability of the results (Davis et al., 2005, Saunders et al., 2011, Sekaran and Bougie, 2011). Sekaran (2003) describes that systematic review of literature is the process that identifies and integrates all the available research evidence of sufficient quality related to a specific topic. The purpose of a systematic literature review is reviewing and synthesising the evidence in a rigorous and transparent way for enhancing the validity and reliability of the findings. Saunders et al. (2011) also highlight the significance of literature review for validation of instrument and findings of a study. For the study, the researcher establishes the content validity through citation of quality, updated and relevant literature.

3.7 Suggested analytical techniques

After the completion of data collection, data is transferred from hard copy to electronic form (Bryman and Bell, 2007). Also, the data is cleaned; any case having missing values or having a standard deviation equal to zero is removed. Reliability analysis is conducted along with descriptive statistics of all the questionnaires. Furthermore, analysis of variance, correlations, factor analysis, regression and structural equation modelling is also be applied. The execution of all these tests required various software like Microsoft Excel, IBM SPSS and R.

3.8 Summary

This chapter has presented research methods to be used for the current study. Pakistani public sector and private sector HEIs using ERPS are accessed to get three questionnaires filled, one for each layer; the organisational, the departmental and the end-user. The researcher visited 18 HEIs, located in nine different cities of Pakistan, personally to increase the response rate. The survey is quantitative in nature. Layder's research resource map is extended to interlink research objectives, conceptual framework and the research methods. In next chapters, the analysis is conducted using statistical analysis software; Microsoft Excel, IBM SPSS and R.

Chapter 4. Pilot Study Data Collection and Analysis

4.1 Introduction

The pilot test is defined as "a test run of a set of questionnaire items to detect problems with the questions and questionnaire design" (De Vaus, 2002, p.392). It provides a chance to identify areas of improvement and refine the research instrument before the study is conducted on a wider scale (Bryman and Bell, 2007, VanderStoep and Johnson, 2008, Yin, 2009, Saunders et al., 2011). Feedback of the pilot test goes back into the questionnaires regarding any omission, error or inconsistency (Mehta, 2010). It also provides some understanding of the validity and reliability of the data and ensures the research questions can be answered (Saunders et al., 2011).

Three questionnaires are distributed to organisational, departmental and end-user layers for pilot study data collection. The response rate is 65 percent for the pilot study. The screening of collected data is carried out for missing values before conducting the statistical tests required.

4.2 Sampling and sample size

Sampling is the technique that is used to choose certain groups from the population (Oliver and Jupp, 2006). The pilot study comprised of one HEI. The selected HEI is the largest in the country suited best for the pilot study situated in the second largest city of Pakistan. All the members of the HEIs in HE01 are approached personally.

4.3 Pilot study data collection

For this study, a pilot test is conducted in HE0I. A list of the potential respondents is developed through the information provided by Information Technology Center of HE01. The first layer is the organisational layer, which focused on the top management involved in the decision making regarding ERPS. Eight potential respondents are identified and questionnaires are personally distributed by the researcher to each one of them; and all questionnaires are collected back, making a response rate of 100 percent. On the second layer, departmental layer, the departmental heads are the potential respondents. The total number of departments in HE01 is 90, of which only 60 departments are using ERPS. The number of questionnaires distributed at the departmental layer is 57 and questionnaires received back from departmental heads are 30, making a response rate of 53 percent.

There are a few reasons for the low response rate at the departmental layer. Firstly, a few potential respondents refused to fill in the questionnaire because they believed themselves unsuitable for responding to the questionnaire for this study. Secondly, a few departmental heads were appointed recently and therefore, were not qualified to respond to the questionnaire. Finally, some potential respondents were on long leave; therefore, they were not available to respond to the questionnaire. The process of collecting data from the departmental heads involved repeated visits and follow-ups.

The last layer is an end-user layer which focused on the faculty members and employees who are using ERPS. The faculty members of only one department are using ERPS. In all other departments, only employees in each department are ERPS users. The number of faculty members using ERPS is 66 and the number of employees using ERPS is 116, making a total of 182 potential respondents of ERPS in HE01. At this layer, 138 questionnaires are personally distributed. Rest of the respondents are either on leave or they are not willing to fill in the questionnaire. Out of 138 distributed questionnaires, 93 are returned by the respondents, making a response rate of 67 percent.

Overall, 131 questionnaires from the organisational, departmental and end-user layers are collected for the pilot study. The questionnaires are paper-based, so data is coded and entered into comma separated value (CSV) files using Microsoft Excel because it is more feasible and efficient to analyse the data electronically rather than manually (Saunders et al., 2011). A unique anonymized identification number is allocated to each questionnaire (De Vaus, 2002). Later, the comma separated values files are used for analysis using R; statistical analysis software. The data collection is summarised in Figure 4.1.

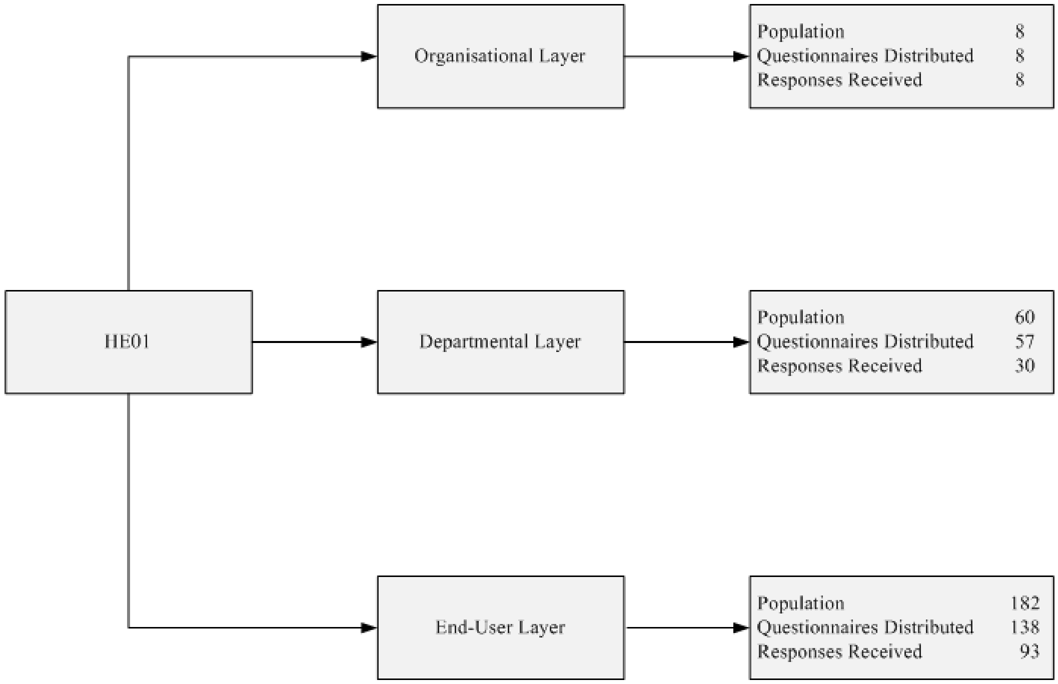

Figure 4.1-Pilot study data collection

4.4 Pilot study data analysis

Having explained the pilot study data collection of 131 questionnaires through three questionnaires, this section presents the findings drawn from statistical analysis of the data. As discussed above, the purpose of the pilot study is to test run three questionnaires regarding the factors affecting the usage of ERPS across organisational, departmental and end-user layer in HE01 in Pakistan.

This section presents the findings drawn from statistical analysis of the pilot study data. It also offers details of tests including questionnaire reliability, demographic statistics, testing of demographic differences, exploratory data analysis, correlations, factor analysis, regression analysis and structural equation modelling. SEM is an advanced technique as compared to regression analysis. While regression analysis uses the method of adding average item scores to identify the independent variables, SEM is an advanced methodology that has the capability of including individual question items within the modelling framework to calculate the individual question items scores as well as the independent variables scores. Significant findings of the pilot study are then analysed in the context of the conceptual framework and used to test the researcher hypotheses devised in Chapter 2.

4.4.1 Data screening

Data screening refers to a set of procedures used to detect, identify, and make decisions about any abnormalities in the data (Duffy, 2006). Pilot study data is screened to identify and deal with missing data (Martin and Bridgmon, 2012). Records with missing values are excluded from the dataset.

It is essential to deal with missing data at the initial stages, as it can affect the power of the study in establishing relationships in the subsequent stages of analysis (Duffy, 2006). The researcher must check how much data is missing. If missing data has any pattern, the researcher has to understand the reasons of missing data and make decisions about dealing with it. The threshold for missing data is flexible, but generally, if missing values are more than 10 percent of the responses on a particular variable, or from a particular respondent, that variable or respondent may be problematic. There are several ways to deal with problematic variables. To impute missing values, different techniques are used like plugging in mean value, median value etc. Replacing missing values with mean value or any other method is not used as the new data may produce the results that are not intended to represent the original data results. The researcher has preferred to exclude any records having missing values in it.

Data screening is carried out using the statistical software known as R. Cases with missing values are identified across the three layers. The data at the organisational layer did not have any missing values. Out of the 30 questionnaires collected at the departmental layer; one questionnaire is reported having a missing value so this is excluded from data, leaving 29 questionnaires for this layer. At the end-user layer; out of 93 responses received, 12 cases have missing values and all of these are excluded from the dataset.

4.4.2 Reliability of scale

The second step in the analysis is to check the reliability of the scale. Reliability is calculated through Cronbach's alpha for all the factors identified to be potential contributors to ERPS usage of organisational, departmental and end-user layers. Cronbach's alpha indicates the internal consistency of an instrument; it takes into account both the number of questions as well as the average correlation among the questions within a survey (Sellen, 2001). As a rule of thumb, a reliability 0.70 or above is required (Litwin, 1995).

4.4.2.1 Organisational layer

At organisational layer, the Cronbach's alpha is calculated for all factors involved at this layer, the number of respondents at this layer is 8. The number of respondents is very small at this layer. However, most of the factors showed good reliability describing that the question items are measuring the concept. The maximum benefits realisation while lowest is observed of training. The Cronbach's alpha and a number of question items in each factor are presented in Table 4.1.

Table 4.1-Pilot study organisational layer Cronbach's alpha

Factors	Cronbach's Alpha	Number of Items
Organisational Culture	0.58	8
Human Resource Availability	0.56	6
Tolerance for Risks and Conflicts	0.77	6
Collegial Support and Collaboration	0.79	4
Decision Making and Control	0.64	10
Organisational Alignment	0.34	4
Training	0.02	7
Benefit Realisation	0.89	6
Learning Structure	0.50	5

4.4.2.2 Departmental layer

The next layer is a departmental layer with 29 respondents. The factors showed strong reliability. The minimum is 0.68 of performance based reward policy while managerial citizenship behaviour showed highest reliability 0.94. The results of all factors are presented in Table 4.2.

Table 4.2-Pilot study departmental layer Cronbach's alpha

Factors	Cronbach's Alpha	Number of Items
Operational Support	0.89	4
Managerial Patience	0.87	5
Active Advocacy	0.90	4
Management Participation in ERPS Learning Sessions	0.82	4
Managerial Citizenship Behaviour	0.94	6
Power Sharing	0.92	5
Performance Based Reward Policy	0.68	5

4.4.2.3 End-user layer

At end-user layer, the Cronbach's alpha is calculated for all factors involved at this layer, the dataset consists of 81 respondents. Similar to departmental layer, the factors at this layer also observed to present strong reliability of all the factors presented in the model. User satisfaction 0.90 is the maximum while behavioural intentions are the minimum 0.68. The results of all factors are presented in Table 4.3.

Table 4.3-Pilot study end-user layer Cronbach's alpha

Factors	Cronbach's Alpha	Number of Items
Training	0.87	8
Learning Orientation	0.81	5
Behavioural Intentions	0.68	4
Acceptance and Usage of System	0.81	3
Participation and Support	0.75	6
Resistance	0.77	4
Ease of Use	0.93	4
Usefulness	0.89	3
Motivation	0.86	5
User Satisfaction	0.90	5

4.4.3 Descriptive statistics of demographics

The results presented in this section are mostly as the researcher anticipated. Generally, in HEIs in Pakistan, women are not present on top positions except the HEIs that are only for women students. It was also anticipated that top management members would be PhDs and would be highly experienced. At the organisational layer, no women is working as top management official while all respondents of the organisational layer are above 50 years of age holding PhD degrees. It was also expected that some percentage of women will be working as departmental heads while end-users were expected to be younger than the other two layers. The results have endorsed the expectations of the researcher.

4.4.3.1 Overall data

The number of respondents at the organisational layer is eight and all of them are men. All the respondents are above 50 years of age and PhD qualified. The majority has more than 20 years of total work experience and a significant majority, 88 percent, has more than four years of experience of dealing with ERPS.

At the departmental layer, there are 29 respondents, the majority is above 50 years of age, 66 percents are men and 93 percent have a PhD qualification. Regarding work experience, 86 percent have more than 20 years and 68 percent have more than three years of ERPS related experience in supervising staff members within their respective departments. 41 percent have more than four years of experience in supervising their staff members regarding ERPS usage while 27 percent are having more than three years of supervisory experience. It is also noted that 17 percent are having less than one year of experience of supervising ERPS.

At the end-user layer, almost 90 percent of the respondents are men and the majority is under 40 years of age. The overall experience of the majority of the respondents at the end-user layer is less than the experience of the respondents in the above two layers, i.e., a quarter of the respondents have less than five years of overall experience, around 50 percent have more than three years of ERPS usage experience while 15 percent have less than one year experience. The highest education achieved has shown variations, nevertheless, the respondents at this layer are generally less qualified than the respondents at the above two layers: only six percent users have a PhD qualification while around 12 percent have only intermediate[6] qualifications. A brief comparative summary of the demographic statistics of the respondents at the three layers is presented in Table 4.4.

[6] Intermediate level qualification in Pakistan is comparable to twelfth grade in the UK education system.

Table 4.4-Pilot study demographic statistics

Layer	Frequency	Male		Age (50+)		PhD		Experience in Years: Overall (20+ Years)		In HEIs (20+ Years)		Using ERPS (4+ Years)	
Org	8	8	100%	8	100%	8	100%	7	88%	6	75%	7	88%
Dep	29	19	66%	16	55%	27	93%	25	86%	20	69%	12	41%
End-user	81	73	90%	1	1%	5	6%	3	4%	2	3%	22	27%

4.4.3.2 Organisational layer

The number of respondents at the organisational layer is eight, and all of them are men. There is no female in the top management involved in decision making regarding ERPS. In terms of age, all of the respondents are above fifty years of age and all of them are highly qualified in terms of having doctoral degrees. One respondent has 15-20 years of total experience, and the remaining seven out of the eight respondents have more than 20 years of total experience. Similar frequencies are observed in terms of the experience in HEIs where 75 percent of the respondents are having more than 20 years of experience while 25 percent have experience of more than 10 years. In terms of the experience of respondents in the current HEI, 50 percent are having more than 20 years' experience while almost 13 percent have between 5-10 years' experience, and 38 percent have more than five years. Also, 38 percent are working in that particular organisation for more than 10 years. In being experienced dealing with ERPS, only one respondent have less than two years of experience, the remaining have more than four years of experience. The details are presented in Table 4.5.

Table 4.5-Pilot study organisational layer frequency table (N=8)

Org-Gender					
		Frequency	Percent	Valid Percent	Cumulative %
Valid	Male	8	100	100	100

Org-Age Group					
		Frequency	Percent	Valid Percent	Cumulative %
Valid	51-55	3	37.50	37.50	37.50
	56-60	5	62.50	62.50	100
Org-Highest Education Achieved					
		Frequency	Percentage	Valid %	Cumulative %
Valid	PhD	8	100	100	100
Org-No of Years in Employment					
		Frequency	Percent	Valid %	Cumulative %
Valid	16-20	1	12.50	12.50	12.50
	Above 20	7	87.50	87.50	100
Org-Experience in HEIs Years					
		Frequency	Percentage	Valid %	Cumulative %
Valid	11-15	1	12.50	12.50	12.50
	16-20	1	12.50	12.50	25.00
	Above 20	6	75.00	75.00	100
Org-Experience in Current HEI Years					
		Frequency	Percentage	Valid %	Cumulative %
Valid	6-10	1	12.50	12.50	12.50
	11-15	3	37.5	37.50	50.00
	Above 20	4	50.00	50.00	100
Org-Experience Dealing with ERPS Years					
		Frequency	Percentage	Valid %	Cumulative %
Valid	Less than 2	1	12.5	12.5	12.5
	Above 4	7	87.5	87.5	100.0

4.4.3.3 Departmental layer

At the middle management layer i.e. the departmental layer, there are 29 cases after data screening. Out of all, 65 percent of the respondents are men and 35 percent are women. This is in contrast to the gender demographics at the top layer where all the respondents are men. In terms of age, 55 percent are above 50 years while the remaining 45 percent are above 40 years old. Out of all the departmental heads, 93 percent are holding doctoral degrees. With regards to the experience, 86 percent of the respondents have more than 20 years of overall experience, and almost 60 percent of the respondents have been working in the particular HEI for more than 20 years compared to 35 percent working for between 10-20 years. All departmental heads have shared that they are supervising ERPS to enhance usage in the respective units. The majority are having more than three years of experience; forty-one percent are having more than four years of experience in supervising their staff members regarding ERPS usage while 27 percent are having more than three years. It is also noted that 17 percent are having less than one year of experience. The details are presented in Table 4.6.

Table 4.6-Pilot study departmental layer frequency table (N=29)

Dep-Gender					
		Frequency	Percentage	Valid %	Cumulative %
Valid	Male	19	65.50	65.50	65.50
	Female	10	34.50	34.50	100
Dep-Age Group					
		Frequency	Percentage	Valid %	Cumulative %
Valid	41-45	3	10.30	10.30	10.30
	46-50	10	34.50	34.50	44.80
	51-55	9	31.00	31.00	75.90
	56-60	7	24.10	24.10	100
Dep-Highest Education Achieved					
		Frequency	Percentage	Valid %	Cumulative %
Valid	PhD	27	93.10	93.10	93.10
	MPhil	2	6.90	6.90	100
Dep-No of Years in Employment					
		Frequency	Percentage	Valid %	Cumulative %
Valid	11-15	3	10.30	10.30	10.30
	16-20	1	3.40	3.40	13.80
	Above 20	25	86.20	86.20	100
Dep-Experience in HEIs Years					
		Frequency	Percentage	Valid %	Cumulative %
Valid	11-15	6	20.70	20.70	20.70
	16-20	3	10.30	10.30	31.00
	Above 20	20	69.00	69.00	100
Dep-Experience in Current HEI Years					
		Frequency	Percentage	Valid %	Cumulative %
Valid	6-10	2	6.90	6.90	6.90
	11-15	7	24.10	24.10	31.00
	16-20	3	10.30	10.30	41.40
	Above 20	17	58.60	58.60	100
Dep-Experience Supervising ERPS Years					
		Frequency	Percentage	Valid %	Cumulative %
Valid	Less than 1	5	17.20	17.20	17.20
	Less than 2	2	6.90	6.90	24.10
	Less than 3	2	6.90	6.90	31.00
	Less than 4	8	27.60	27.60	58.60
	Above 4	12	41.40	41.4	100

4.4.3.4 End-user layer

At the end-user layer, respondents are the users of ERPS who are involved directly in using the system. Almost 90 percent of the respondents are men and the majority is less than 40 years of age; almost 30 percent are from the age group 30-40 years and almost 37 percent are under 30 years of age. Only two percent above the age of 45 are found to be using ERPS.

The highest education achieved showed variations: around 12 percent of respondents are having only intermediate qualification while around 30 percent have a graduate degree. More than 50 percent are having masters' degrees while only six percent users of ERPS have doctoral degrees.

The overall experience of the majority of the respondents at the end-user layer is relatively low. One fourth of the total are having less than five years of experience and around 50 percent are having total experience less than ten years. Similar findings are observed in the overall experience of the staff in HEIs where 48 percent of the respondents are having between 6-10 years' experience and about 25 percent are having less than five years of experience. In terms of the experience of the staff in the current HEI, the majority have less than 10 years' experience while only two percent have more than 20 years of experience. Around 50 percent are having more than three years of ERPS usage experience, 27 percent have more than four years, 22 percent have more than three years and 15 percent have less than one year experience. The complete details are shown in Table 4.7.

Table 4.7-Pilot study end-user layer frequency table (N=81)

EU-Gender					
		Frequency	Percentage	Valid %	Cumulative %
Valid	Male	73	90.10	90.10	90.10
	Female	8	9.90	9.90	100
EU-Age Group					
		Frequency	Percentage	Valid %	Cumulative %
Valid	18-25	11	13.60	13.60	13.60
	26-30	19	23.50	23.50	37.00
	31-35	24	29.60	29.60	66.70
	36-40	17	21.00	21.00	87.70

	41-45	8	9.90	9.90	97.50
	46-50	1	1.20	1.20	98.80
	51-55	1	1.20	1.20	100
EU-Highest Education Achieved					
		Frequency	Percentage	Valid %	Cumulative %
Valid	PhD	5	6.20	6.20	6.20
	MPhil	22	27.20	27.20	33.30
	Masters	20	24.70	24.70	58.00
	Bachelors	24	29.60	29.60	87.70
	Intermediate	7	8.60	8.60	96.30
	Matriculation	3	3.70	3.70	100
EU-No of Years in Employment					
		Frequency	Percentage	Valid %	Cumulative %
Valid	0-5	21	25.90	25.90	25.90
	6-10	39	48.10	48.10	74.10
	11-15	12	14.80	14.80	88.90
	16-20	6	7.40	7.40	96.30
	Above 20	3	3.70	3.70	100
EU-Experience in HEIs Years					
		Frequency	Percentage	Valid %	Cumulative %
Valid	0-5	22	27.20	27.20	27.20
	6-10	42	51.90	51.90	79.00
	11-15	11	13.60	13.60	92.60
	16-20	4	4.90	4.90	97.50
	Above 20	2	2.50	2.50	100
EU-Experience in Current HEI Years					
		Frequency	Percentage	Valid %	Cumulative %
Valid	0-5	27	33.30	33.30	33.30
	6-10	39	48.10	48.10	81.50
	11-15	9	11.10	11.10	92.60
	16-20	4	4.90	4.90	97.50
	Above 20	2	2.50	2.50	100
EU-Experience as ERPS User Years					
		Frequency	Percentage	Valid %	Cumulative %
Valid	Less than 1	12	14.80	14.80	14.80
	Less than 2	13	16.00	16.00	30.90
	Less than 3	16	19.80	19.80	50.60
	Less than 4	18	22.20	22.20	72.80
	Above 4	22	27.20	27.20	100

4.4.4 Exploratory data analysis

Exploratory data analysis is a quantitative data-analytic tradition to identify the major features of the specific data set (Behrens and Yu, 2003). The mean is calculated by adding the values for each variable and dividing by the total number of cases. Standard deviation, which is used in conjunction with mean, gives an overall idea of how spread out the values are from the mean (Black, 1999).

For the pilot test, firstly, the standard deviation of each row is calculated on every layer. At the organisational layer, no case having zero standard deviation is reported thus all cases are used for further analysis; while at the departmental layer, one case is reported to have zero standard deviation and thus excluded from the dataset, making the sample size at this layer 28. End-user layer remained unchanged.

Means and standard deviations of the pilot study data are calculated. At the organisational layer, respondents have a level of agreement to the existence of benefits realisation which is having the highest mean value among all variables; while organisational culture is considered to have the highest spread of data and learning structure is having the lowest spread. While decision making and control has the lowest mean of 3.79. On all other variables at the organisational layer, respondents agreed with mean values of little above four. Learning structure has lowest standard deviation at the organisational layer with value 0.07 showing that majority of respondents responded are agreed and deviation of mean is very low while organisational culture has highest standard deviation 0.70.

At the departmental layer, the majority of the respondents have agreed to some extent to the existence of operational support and to the non-existence of performance based reward policies. Maximum mean at this layer is observed in operational support 3.98 described as the majority of users of ERPS have agreed to the existence of operational support. Minimum mean value 3.27 is of performance based reward policy. This explains that performance-based rewards policies need improvement.

Highest deviation from mean is found in managerial citizenship behaviour at the departmental layer. The lowest standard deviation is observed of performance based reward policy. Mean value of performance-based reward policy is also the lowest in generated analysis. It is opined that majority of the respondents are not happy about performance based reward policies. All other variables have a standard deviation of around 0.70 that is considered to be quite high.

At the end-user layer, learning orientation has the highest level of agreement and the lowest variation of 0.56. The results have shown that participation and support are not present while ease of use has the highest variation from the mean value. Usefulness has also quite a high variation closer to one. Learning orientation is agreed upon the most with highest mean of 4.12. Lowest mean is observed in participation and support. Ease of use is showing highest variation from the mean value with a standard deviation of 1.10 and learning orientation has lowest standard deviation 0.56.

Table 4.8 presents the means and standard deviations of the factors at the three layers in one place. Initially, the factors are identified for each of three layers from literature; later, questionnaires are designed to measure the factors identified and lastly, pilot study is conducted to collect data for each of three layers using the questionnaires designed.

Table 4.8-Pilot study descriptive statistics

Org Layer	Mean	SD.	Dep Layer	Mean	SD.	End-user Layer	Mean	SD.
Organisational Culture	4.08	0.70	Operational Support	3.99	0.68	Training	3.34	0.80
Human Resource Availability	4.04	0.33	Managerial Patience	3.87	0.75	Learning Orientation	4.12	0.56

Org Layer	Mean	SD.
Tolerance for Risks and Conflicts	4.19	0.56
Collegial Support and Collaboration	4.09	0.42
Decision Making and Control	3.79	0.35
Organisational Alignment	4.09	0.38
Training	4.05	0.23
Benefit Realisation	4.25	0.46
Learning Structure	4.03	.07

Dep Layer	Mean	SD.
Active Advocacy	3.91	0.75
Management Participation in ERPS Learning Sessions	3.26	0.76
Managerial Citizenship Behaviour	3.67	0.78
Power Sharing	3.81	0.70
Performance Based Reward Policy	3.27	0.64

End-user Layer	Mean	SD.
Behavioural Intentions	3.71	0.61
Acceptance and Usage of System	3.79	0.86
Participation and Support	3.25	0.67
Resistance	3.60	0.83
Ease of Use	3.51	1.10
Usefulness	3.54	0.96
Motivation	3.66	0.79
User Satisfaction	3.81	0.88

4.4.5 Tests of demographic differences

T-test and Analysis of Variance (ANOVA) analyse the spread of data values, within and between groups of data (Saunders et al., 2011). The t-test is used for two groups while ANOVA is used for more than two groups of data to be analysed (Gorard, 2003). One-way ANOVA examines the relationship between one independent and one dependent variable by giving F value. If the F value indicates the test is statistically significant, this means that there is significant difference. If the groups formed by categories of the independent variable are not similar then it is inferred that the independent variable has some effect on the dependent variable (Singh, 2007). T-test and ANOVA are run to test for the significant differences. The independent variables for all layers are gender, age, highest education achieved, total experience, experience in HEIs, experience in current HEI and experience using ERPS. Independent variables are tested for significant difference with the dependent variables for each layer.

4.4.5.1 Organisational Layer

At the organisational layer, results showed there are significance differences among categories in certain demographic factors. As only one HEI is selected for pilot study so sectors are not involved. Also, all the respondents are male and all are employees. Moreover, no significant differences are observed in rest of the demographics.

4.4.5.2 Departmental Layer

The demographic difference on departmental layer produced demographic differences in categories than the organisational layer. Performance based reward policy expressed difference among categories in total experience in HEIs and experience in current HEI while experience using ERPS showed the difference in managerial policy. The independent variables are same as described in Section 4.4.5 while the dependent variables for the departmental layer are operation support, managerial patience, active advocacy, management participation in ERPS learning sessions, managerial citizenship behaviour, power sharing, performance based reward policy and usage of ERPS at departmental layer. The significant differences observed are presented in Table 4.9.

Table 4.9-Pilot study departmental layer demographic differences

Independent Variables	Dependent Variables							
	OS	MP	AA	MPLS	MCB	PS	PBRP	UD
Gender								
Age								
Highest Education Achieved								
Total Experience							✓	
Experience in HEIs							✓	

Independent Variables	**Dependent Variables**							
	OS	**MP**	**AA**	**MPLS**	**MCB**	**PS**	**PBRP**	**UD**
Experience in Current HEI								
Experience using ERPS		✓						

✓ *indicates there are significant differences among categories*

Legend-departmental layer

OS	Operational Support	**MCB**	Managerial Citizenship Behaviour
MP	Managerial Patience	**PS**	Power Sharing
AA	Active Advocacy	**PBRP**	Performance Based Reward Policy
MPLS	Management Participation in ERPS Learning Sessions		
UD	Usage of ERPS at Departmental Layer		

4.4.5.3 End-User Layer

The end-user layer also produced significant differences regarding the opinion of respondents across different categories. At this layer, the category has both respondents; employees and teachers. The differences in the category are observed in all factors except learning orientation and usefulness. The independent variables are same as described in Section 4.4.5 while the dependent variables for the end-user layer are training, learning orientation, behavioural intentions, acceptance and usage of system, participation and support, resistance, ease of use, user satisfaction and usefulness, motivation, user satisfaction and usage of ERPS at end-user layer. The significant differences observed are presented in Table 4.10.

Table 4.10-Pilot study end-user layer demographic differences

Independent Variables	**Dependent Variables**										
	TR	**LO**	**BI**	**AUS**	**PS**	**RE**	**EOU**	**USF**	**MT**	**US**	**UE**
Gender							✓				
Age	✓					✓					✓
Highest Education Achieved											
Total Experience	✓								✓		
Experience in HEIs	✓		✓		✓		✓	✓			✓
Experience in Current HEI											✓

Independent Variables	Dependent Variables										
	TR	LO	BI	AUS	PS	RE	EOU	USF	MT	US	UE
Experience using ERPS				✓		✓			✓		

✓ *indicates there is significant differences among categories*

Legend-end-user layer

TR	Training	**RE**	Resistance
LO	Learning Orientation	**EOU**	Ease of Use
BI	Behavioural Intentions	**USF**	User satisfaction and usefulness
AUS	Acceptance and Usage of System	**MT**	Motivation
PS	Participation and Support	**US**	User Satisfaction
UE	Usage of ERPS at End-user Layer		

4.4.6 Correlations

Correlation refers to the strength of the direct relationship between two variables measured on an ordinal or interval or ratio scales, that if one variable increases or decreases, so does the other variable (Singh, 2007). The strength of the linear relationship between two variables can be quantified through correlations (Saunders et al., 2011). Correlation value is used to look at the linear relationships between two variables. Correlation tests are conducted on three layers to check the existence of relationships, if any, among independent variables and also to observe the strength of the positive or negative relationships.

4.4.6.1 Organisational layer

At the organisational layer, correlation test produced results indicating the correlation between organisational culture and decision-making and control. Also, tolerance for risks and conflicts showed high correlation with benefits realisation and decision making and control. Lastly, decision making and control is highly correlated with benefits realisation. The details are given in Table 4.11.

Table 4.11-Pilot study organisational layer correlation matrix

Factors	OC	HRA	TRC	CSC	DMC	OA	TR	BR	LS
Organisational Culture	1								
Human Resource Availability	0.58	1							
Tolerance for Risks and Conflicts	0.48	0.99	1						
Collegial Support and Collaboration	0.27	0.43	-0.54	1					
Decision Making and Control	0.76*	0.43	0.76*	-0.20	1				
Organisational Alignment	0.53	0.01	0.02	0.61	0.07	1			
Training	0.59	0.59	0.25	0.58	0.21	0.64	1		
Benefit Realisation	0.51	0.08	0.81*	-0.50	0.76*	0.05	0.04	1	
Learning Structure	0.43	-0.05	0.47	-0.09	0.62	0.44	0.15	0.66	1

$* p < 0.05$

4.4.6.2 Departmental layer

At departmental layer, most of the factors showed moderate correlation with the highest correlation between active advocacy and managerial citizenship behaviour while lowest is between performance based reward policy and managerial citizenship behaviour. The details are given in Table 4.12.

Table 4.12-Pilot study departmental layer correlation matrix

Factors	OS	MP	AA	MPLS	MCB	PS	PBRP
Operational Support	1						
Managerial Patience	0.40*	1					
Active Advocacy	0.61*	0.56**	1				
Management Participation in ERPS Learning Sessions	0.29	0.42*	0.30	1			
Managerial Citizenship Behaviour	0.54**	0.56**	0.71**	0.50**	1		
Power Sharing	0.34	0.66**	0.45*	0.43*	0.51**	1	
Performance Based Reward Policy	0.32	0.41*	0.39*	0.31	0.26	0.39*	1

$** p < 0.01$, $* p < 0.05$

4.4.6.3 End-user layer

At the end-user layer, the results are similar to departmental layer, showing the moderate correlation among the majority of the factors. The details are presented in Table 4.13.

Table 4.13-Pilot study end-user layer correlation matrix

Factors	TR	LO	BI	AUS	PS	RE	EOU	USF	MT	US
Training	1									
Learning Orientation	0.15	1								
Behavioural Intentions	0.27**	0.41**	1							
Acceptance and Usage of System	0.10	0.51**	0.47**	1						
Participation and Support	0.53**	0.54**	0.43**	0.48**	1					
Resistance	0.01	0.38**	0.25	0.53**	0.29	1				
Ease of Use	0.14	0.41**	0.32**	0.64**	0.46**	0.57**	1			
Usefulness	0.18	0.48**	0.34*	0.67**	0.57**	0.56**	0.85**	1		
Motivation	0.28**	0.60**	0.47**	0.71**	0.65**	0.49**	0.65**	0.69**	1	
User Satisfaction	0.23*	0.48**	0.43**	0.70**	0.61**	0.59**	0.86**	0.89**	0.74**	1

*** $p < 0.01$, * $p < 0.05$*

4.4.7 Exploratory factor analysis

Exploratory Factor Analysis (EFA) is used to reduce a large number of variables to a smaller set of factors (Litwin, 1995, De Vaus, 2002). It not only reduces the number of variables in the study but also helps to identify the underlying source of variation between variables (Singh, 2007). Factor analysis refers to a set of multivariate computer-assisted statistical methods to reduce a large number of variables to a smaller set of underlying variables, or factors, so it is used to define the underlying structure in a data matrix (Litwin, 1995, De Vaus, 2002).

If the dataset is very small then EFA may not produce significant results, alternatively, cronbach's alpha with an if-item-deleted option can be used to identify the question items that are contributing negatively to alpha value (Singh, 2007). On the other hand, Confirmatory Factor Analysis (CFA) is used to confirm the consistency between the factors of a research instrument and the understanding of the researcher. As new research questionnaires are developed for the pilot study; therefore, first EFA is carried out to find out the number of factors, and the relevant questions items contributing to each factor, and later, CFA is run to confirm the results of EFA.

Regarding exploratory factor analysis, the dataset for the organisational layer is very small as this layer targeted only on policy makers. Similarly, departmental layer also has a few responses from departmental heads. Therefore, it is not suitable to run factor analysis at these two layers. Alternatively, Cronbach's alpha is calculated separately for each factor using if-item-deleted option.

4.4.7.1 Organisational layer

The dataset for this layer is very small as this layer targeted only policy makers who are very few in any organisation. As discussed above, it is not suitable to run factor analysis due to small dataset, therefore, Cronbach’s Alpha is calculated focusing on the alpha value of if item deleted.

At the organisational layer, there are eight responses and the number of question items in each factor varied. Three factors showed improvement in alpha after one question item from each factor was removed; organisational alignment, training, and decision-making and control. Similarly, as alpha values were very low for setting up learning structure, that was removed from the questionnaire. Decision making and control showed the alpha value as 0.62, which increased to 0.77 after removing question item number O5_04 of decision making and control as it was contributing negatively to the value of Alpha. Similarly, question item number

O06_02 was removed from organisational alignment factor to increase alpha from 0.34 to 0.67 while question number O07_3 was removed from training to use ERPS to improve alpha from 0.16 to 0.60. Only setting up learning structure for ERPS was removed completely as alpha values of all question items were very low. The refined questionnaire for organisational layer consists of eight factors and 45 question items as shown in Table 4.14.

Table 4.14-Pilot study organisational layer reliability analysis

Factors	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Alpha
Organisational Culture	0.86	0.91	0.86	0.90	0.81	0.82				0.89
Human Resource Availability	0.57	0.51	0.55	0.51	0.37	0.51				0.56
Tolerance for Risks and Conflicts	0.72	0.78	0.75	0.73	0.72	0.71				0.77
Collegial Support and Collaboration	0.83	0.69	0.71	0.67						0.79
Decision Making and Control	0.51	0.52	0.51	**0.77**	0.65	0.62	0.41	0.57	0.57	0.62
Organisational Alignment	-0.38	**0.67**	0.07	0.07						0.34
Training	-0.69	-0.69	**0.60**	-0.30	-0.30	0.27	0.27			0.02
Benefit Realisation	0.86	0.86	0.83	0.86	0.88	0.91				0.89
Learning Structure	**-4.90**	**-3.30**	**-0.60**	**-2.10**	**-5.70**					-7.50

4.4.7.2 Departmental layer

The dataset for this layer is also small consisting of twenty-nine cases. Similar to organisational layer, it is not suitable to run factor analysis due to small dataset, therefore, Cronbach's Alpha is calculated focusing on the alpha value of if item deleted. No question items are found to be negative contributors to Alpha hence the instrument at this layer remained unchanged. The details are presented in Table 4.15.

Table 4.15-Pilot study departmental layer reliability analysis

Factors	Q1	Q2	Q3	Q4	Q5	Q6	Alpha
Operational Support	0.84	0.85	0.86	0.85			0.89
Managerial Patience	0.86	0.84	0.82	0.84			0.86
Active Advocacy	0.87	0.85	0.89	0.87			0.90
Management Participation in ERPS Learning Sessions	0.73	0.76	0.73	0.84			0.81
Managerial Citizenship Behaviour	0.93	0.93	0.93	0.93	0.93	0.92	0.94
Power Sharing	0.90	0.92	0.90	0.88	0.89		0.91
Performance Based Reward Policy	0.63	0.59	0.63	0.63	0.63		0.67

4.4.7.3 End-user layer

At the end-user layer, there are 81 respondents which are a suitable number to run a factor analysis. Exploratory factor analysis is run with ten factors using oblimin technique in order to minimise the correlations between the components (Basilevsky, 2009). The recommended value for KMO (Kaiser Meyer Olkin) is 0.50 (Kaiser, 1974) while KMO of the end-user layer is 0.79, this is significant with ten independent variables and 47 items. Root mean square of the above-said variables is 0.03 that is good as the value closer to zero is better (Field, 2009).

It is observed that total eight factors are classified as a result of exploratory factor analysis. Training factor shows that E01_08 is not loaded while rest seven question items of training are loaded significantly. Ease of use and resistance are loaded with three items each excluding one question item from both. Learning orientation and behavioural intentions are separately loaded excluding two question items each. Participation and support are loaded with two question items while four are not loaded on this factor. Two variables are loaded in one factor; usefulness and user satisfaction. E08_03 is loaded from usefulness and three items are loaded from user satisfaction. The details are presented in Table 4.16.

Table 4.16-Pilot study end-user layer exploratory factor analysis

Factors	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Alpha
Training	0.70	0.77	0.85	0.65	0.82	0.52	0.59	**0.89**
Learning Orientation	0.75	0.86	0.64					**0.81**
Behavioural Intentions			0.51	0.65				**0.53**
Acceptance and Usage of System	0.50	0.55	0.69					**0.80**
Participation and Support			0.61	0.67				**0.79**
Resistance	0.87	0.78	0.83					**0.85**
Ease of Use	0.54	0.93	0.82					**0.93**
Usefulness &			0.63					**0.91**
User Satisfaction		0.61	0.64	0.72				

Factors correlation is also calculated. Training is found as not correlated significantly with all other factors. Usefulness & user satisfaction has a weak correlation with learning orientation and acceptance & usage of the system. Further, learning orientation is observed to have a weak correlation with resistance and acceptance & usage of the system. Similarly, resistance is found to be correlated weakly with acceptance & usage of the system and participation & support. No factor correlation value is found to be greater than 0.70. The details are presented in Table 4.17.

Table 4.17-Pilot study end-user layer factor correlations

Factors	TR	LO	BI	A&U	P&S	Res	EOU
Training							
Learning Orientation	0.02						
Behavioural Intentions	0.16	0.05					
Acceptance and Usage of System	0.07	0.41	0.08				
Participation and Support	0.02	0.27	0.10	0.25			
Resistance	0.11	0.34	0.03	0.37	0.34		
Ease of Use	0.03	0.13	-0.06	-0.01	0.10	-0.01	
Usefulness & User Satisfaction	0.07	0.59	0.08	0.41	0.20	0.26	0.02

4.4.8 Regression analysis

The relationship between two or more interval level variables can be estimated through regression (De Vaus, 2002). Regression can be used to estimate the relationship between a dependent and one or more independent variables (De Vaus, 2002). Regression analysis helps in predicting outcome variables using different explanatory variables (Field, 2009). It helps to estimate the variation in one dependent variable based on the unit change variation in another independent variable through a line of best fit (Singh, 2007). Regression analysis also identifies the positive or negative effect of the independent variables on the dependent variable (Vyas, 2013). This technique helps to identify the best-fitting model based on the statistics, i.e., r-square, adjusted r-square and Mallow's Cp.

The aim of this study is to examine the usage of ERPS in HEIs in Pakistan; therefore, the dependent variable for this study is the usage of ERPS at each layer. Two question items are used to measure ERPS usage at each layer. The questions are same for each layer.

From the factor analysis, the factors of ERPS usage of each layer. i.e., the organisational, the departmental and the end-user layer have been sorted and validated. These factors will take the form of independent variables contributing towards the overall usage at each layer in the regression analysis.

Regression is not carried out at the organisational layer and the departmental layer as the dataset on these two layers is small. At the end-user layer, regression analysis has presented seven models. Each model has a different number of predictors with varying values of r-square, adjusted r-square and Cp. The model with maximum r-square value 0.54 and adjusted r-squared value 0.50 is selected as the best-fitting model. The selected model have seven predictors and explained 50 percent of the variation in the usage of ERPS for end users. The selected model has lowest adjusted r-square 0.499 in comparison with all the other models where highest adjusted r-square is 0.515, with three predictors selected in the model. This shows that the difference of best model and the selected model is quite low 0.016. Furthermore, at this stage of analysis, removing any factor based on minor difference in adjusted r-square is not desired. The reason for selecting the model with all seven predictors is to keep all the factors in the model for the application of an advanced statistical technique called structural equation modelling. The details are presented in Table 4.18.

Table 4.18-Pilot study end-user layer regression

No. of Predictors	R-square	Adjusted R-square	Mallow's CP	TR	LO	AU	PS	RE	EU	UU
1	0.512	0.506	0.986							✓
2	0.525	0.513	0.810						✓	✓
3	0.533	0.515	1.645					✓	✓	✓
4	0.537	0.513	2.938			✓		✓	✓	✓
5	0.541	0.510	4.258	✓		✓		✓	✓	✓
6	0.543	0.506	6.034	✓		✓	✓	✓	✓	✓
7	0.543	0.499	8.000	✓	✓	✓	✓	✓	✓	✓

✓ *indicates that the factor is included in the model*

4.4.9 Structural equation modelling

The results of regression analysis addressed the objectives of the study by identifying the influence of the factors on the usage of ERPS. However, as the first generation multivariate statistical analysis technique, the use of regression is limited in predicting the usage of ERPS on the basis of change in the independent variables. This section utilises SEM, which is second generation multivariate statistical analysis technique, to further investigate the effect of the selected factors on the usage of ERPS. Compared to the predefined traditional techniques which are generally inflexible, SEM provides the liberty to specify customised models and is seen as a comprehensive and flexible methodology (Suhr, 2006). Instead of simply using average scores for each variable as is the case in regression analysis, SEM is an advanced statistical technique that deals with the scores of individual question items to calculate an array of results. SEM technique helps to define a model to include the independent variables and the question items relevant to each variable. SEM techniques are used for quantification and theory testing (Marcoulides and Schumacker, 2013), or even to test complete research models (Roberts and Grover, 2009).

Structural equation modelling is a general term that has been used to describe a large number of statistical models used to evaluate the validity of substantive theories with empirical data. Statistically, it represents an extension of general linear modelling procedures, such as the ANOVA and multiple regression analysis. SEM is a powerful technique of multivariate analysis. SEM also provides the flexibility to define a single model that accommodates individual question items to define each independent variable and the relationship of the dependent variable with independent variables. In other words, individual items of the questionnaire can be used within a single modelling framework to better understand the factors associated with usage of ERPS. The results generated through SEM enable the examination of factor loading scores of each question item, regression scores between dependent and independent variables, and scores to assess model fit. It also delivers the most efficient estimation technique with flexibility to solve a series of regression equations at the same time (Hair et al., 1998, Suhr, 2006).

SEM takes a confirmatory approach to the multivariate analysis of a structural theory to test hypotheses. The goal is to determine whether a hypothesised theoretical model is consistent with the data collected to reflect this theory. The consistency is evaluated through model fit statistics, which indicates the extent to which the postulated network of relations among variables is plausible.

SEM can be applied using a covariance based analysis or a variance based approach, called as partial least squares (Gefen et al., 2000, Hair et al., 2012). Both approaches vary in assumptions and aims. The aim of the covariance based approach is to reproduce the theoretical covariance matrix, without focusing on explained variance, while partial least squares aims at maximizing the explained variance of the dependent constructs. In comparison to the covariance approach, partial least squares approach has less restrictive assumptions and that is one of the reasons why many scholars view it as less suitable (Hair et al., 2011). Further, they explain that covariance based SEM focuses on goodness of fit to observe minimization of the differences between the observed covariance matrix and the estimated covariance matrix. This technique is suitable for testing and confirmation of the presented theory (Hair et al., 2011). The small sample size is also one of the possible reason of applying partial least square method but as suggested by experts that this should not be the main reason. According to Goodhue, Lewis and Thompson (2006), partial least square method does not have adequate statistical power at small sample size. Another difference is that in the covariance based method, the reliable and valid variance is useful for testing relationships while partial least square is aimed to maximize the explained variance of the dependent variables and minimize the unexplained variances (Afthanorhan, 2013). In this study, a theory is presented to be tested and to be confirmed therefore the covariance based SEM is selected as this method is more suitable to test and confirm the theory (Hair et al., 2011).

SEM produces model fit statistics to indicate the closeness between the proposed model and the observed model. Salient indicators of model fit are Root Mean Square Error of Approximation (RMSEA), Comparative Fit Index (CFI), Tucker-Lewis Index (TLI) and Standardised Root Mean Square Residual (SRMR). Comparative Fit Index (CFI) (Bentler, 1990) and Tucker-Lewis Index (TLI) (Tucker and Lewis, 1973) are incremental fit indices to indicate the fit of a model compared to a baseline model. The CFI is equal to the discrepancy function adjusted for sample size. The larger values indicate better fit; values above 0.90 reflect reasonable fit and values above 0.95 indicate good fit (Hu and Bentler, 1999a). Tucker and Lewis's Reliability Coefficient indicates good reliability; larger value indicates better reliability. RMSEA is a measure of discrepancy per degree of freedom in a model (Browne et al., 1993) which can take any value depending on the sample size, the however smaller value generally indicates better model fit. CFI and TLI having larger values indicate good model fit (Hu and Bentler, 1999a). Standardised Root Mean Square Residual (SRMR) is an absolute measure of fit and is defined as the standardised difference between the observed correlation and the predicted correlation (Joreskog and Sorborn, 1981).

Within information system research, SEM is becoming increasingly popular as it is a systematic and comprehensive analytical tool (Roberts and Grover, 2009), that allows the researcher to simultaneously establish the patterns of relationships between various research constructs across individuals, departments or organisations to model the latent variable (Kline, 2011). The Same dataset can be used to model and test alternative models, and to confirm and replicate the results (Roberts and Grover, 2009). Roberts and Grover (2009) conducted a comprehensive review of previous applications of SEM in information system literature and suggested guidelines for the application of SEM from a quantitative perspective. They emphasised on construct validity, model identification, minimum three number of questions per factor, screening of data before doing the analysis, avoiding simple imputation methods for missing values, like mean and median, and the importance of reporting multiple measures of SEM model fit. To date, the application of SEM technique remains neglected in the context of ERPS in HEIs; therefore, this study is the first of its kind.

4.4.9.1 Organisational layer

At the organisational layer, SEM is not used because of the small dataset.

4.4.9.2 Departmental layer

At the departmental layer, the SEM results have shown that RMSEA is 0.32, CFI is 0.30, TLI is 0.24 and SRMR are 0.14. These indicators of model fit that are produced by SEM have presented a weak model fit, which is due to the small dataset of 29 respondents of the pilot study and the results are expected to improve with full dataset. Table 4.19 shows SEM model fit indicators.

Table 4.19-Pilot study departmental layer model fit

RMSEA	CFI	TLI	SRMR	GFI
0.32 (p 0.000)	0.29	0.24	0.14	0.44

Regarding the usage of ERPS at the departmental layer, the results have shown that all the proposed factors have significant, yet varying, effects on the usage of ERPS. Managerial citizenship behaviour has the highest effect 0.87 with high significance at one percent and power sharing has the least effect 0.55 on the usage of ERPS at the departmental layer. Therefore, all the hypothesised factors that are included in the model are accepted.

With regards to the coefficients of determination for SEM (Schreiber et al., 2006), the lowest value is 0.31 for management participation in ERPS learning session which is acceptable. The highest value is 0.75 for managerial citizenship behaviour explaining 75 percent of the variation by six question items of the specified factor. The factor loadings of question items of each independent variable are presented in Table 4.20.

Table 4.20-Pilot study departmental layer SEM factor loadings

Factors	Q1	Q2	Q3	Q4	Q5	Q6
Operational Support	0.96	0.94	0.62	0.65		
Managerial Patience	0.63	0.74	0.90	0.84	0.71	
Active Advocacy	0.92	0.92	0.75	0.75		
Management Participation in ERPS Learning Sessions	0.78	0.78	0.81	0.55		
Managerial Citizenship Behaviour	0.75	0.74	0.79	0.79	0.93	0.96
Power Sharing	0.73	0.64	0.74	0.99	0.96	
Performance Based Reward Policy	0.87	0.84	0.01	0.03	0.64	

The regression coefficients of the factors are showing the effect of independent variables on the usage of ERPS at the departmental layer is reported in Table 4.21.

Table 4.21-Pilot study departmental layer SEM results

Factors	Coefficients	Adjusted R-square
Operational Support	0.66**	0.43
Managerial Patience	0.80**	0.64
Active Advocacy	0.83**	0.69
Management Participation in Learning Sessions	0.56*	0.31
Managerial Citizenship Behaviour	0.87**	0.75

Factors	Coefficients	Adjusted R-square
Power Sharing	0.55*	0.30
Performance Based Reward Policy	0.76**	0.58

** $p < 0.05$, ** $p < 0.01$*

4.4.9.3 End-user layer

At the end-user layer, SEM results are expressing better model fit indicators because of the relatively larger dataset at the end-user layer. RMSEA is 0.11; CFI is reported as 0.83 while SRMR is 0.13. The key values are shown in Table 4.22.

Table 4.22-Pilot study end-user layer model fit

RMSEA	GFI	CFI	TLI	SRMR
0.11 (p 0.000)	0.67	0.83	0.80	0.13

SEM results of the end-user layer have shown that all the proposed factors, except training, have significant effects on the usage of ERPS at that layer. The highest effect is from usefulness and user satisfaction 0.96. Two other factors, acceptance and usage of system 0.82 and ease of use 0.90 also have high effects on the usage of ERPS.

The factor with the highest adjusted r-square at this layer is usefulness and user satisfaction while training has the lowest value. The factor loadings of question items are generated by SEM in Table 4.23.

Table 4.23-Pilot study end-user layer SEM factor loadings

Factors	Q1	Q2	Q3	Q4	Q5	Q6	Q7
Training	0.68	0.68	0.79	0.77	0.87	0.63	0.67
Learning Orientation	0.77	0.81	0.72				
Acceptance and Usage of System	0.72	0.76	0.83				
Participation and Support	0.87	0.75					
Resistance	0.84	0.89	0.70				
Ease of Use	0.94	0.93	0.83				
Usefulness & User Satisfaction	0.87	0.81	0.93	0.84			

The value of each factor and the effects of independent variables on the usage of ERPS at the end-user layer are reported in Table 4.24.

Table 4.24-Pilot study end-user layer SEM results

Factors	Coefficients	Adjusted r-square
Training	0.24*	0.06
Learning Orientation	0.52**	0.27
Acceptance and Usage of System	0.82**	0.68
Participation and Support	0.54**	0.29
Resistance	0.62**	0.38
Ease of Use	0.90**	0.80
Usefulness and User Satisfaction	0.96**	0.92

* $p < 0.05$, ** $p < 0.01$

Thus, the use of SEM has helped to identify the relevant factors affecting the usage of ERPS and showed that the majority of the factors contributed a significantly large proportion of the variance to measure their relevant concepts.

4.5 Revised conceptual framework-Multi Layer Usage Model (MLUM)

There is scant research on the usage of information systems in the Pakistani context. The aim of the research is to examine the factors that contribute to the usage of ERPS across the organisational, departmental and end-user layer in HEIs in Pakistan. It has also focused on the effect of all layers on the overall usage of ERPS in HEI. Layder's (1993) research map is adapted for the conceptual and methodological framework. Empirical data for the pilot study consisted of 131 responses are collected from one HEI using three distinct questionnaires, one for each of the three layers.

At the organisational layer, only setting up learning structure do not contribute to the usage of ERPS at the organisational layer while all other factors including organisational culture, benefits realisation, human resource availability, tolerance for conflicts and risks, collegial support and collaboration, decision making and control and organisational alignment are the significant contributors to the usage of ERPS at the organisational layer.

At the departmental layer, the empirical findings show that all the factors presented in model are significant contributors to the usage of ERPS at the departmental layer. The factors include operational support, managerial patience, active advocacy, management participation in ERPS learning sessions, management citizenship behaviour, power sharing, and performance based reward policy.

Finally, at the end-user layer, the findings show that motivation is not proved to be a significant contributor to the usage of ERPS at the end-user layer while usefulness and user satisfaction are identified as one factor instead of two separate factors as originally proposed in the model. Moreover, all other factors that are training, learning orientation, acceptance and usage of system, participation and support, resistance and ease of use have affected the usage of ERPS at the end-user layer.

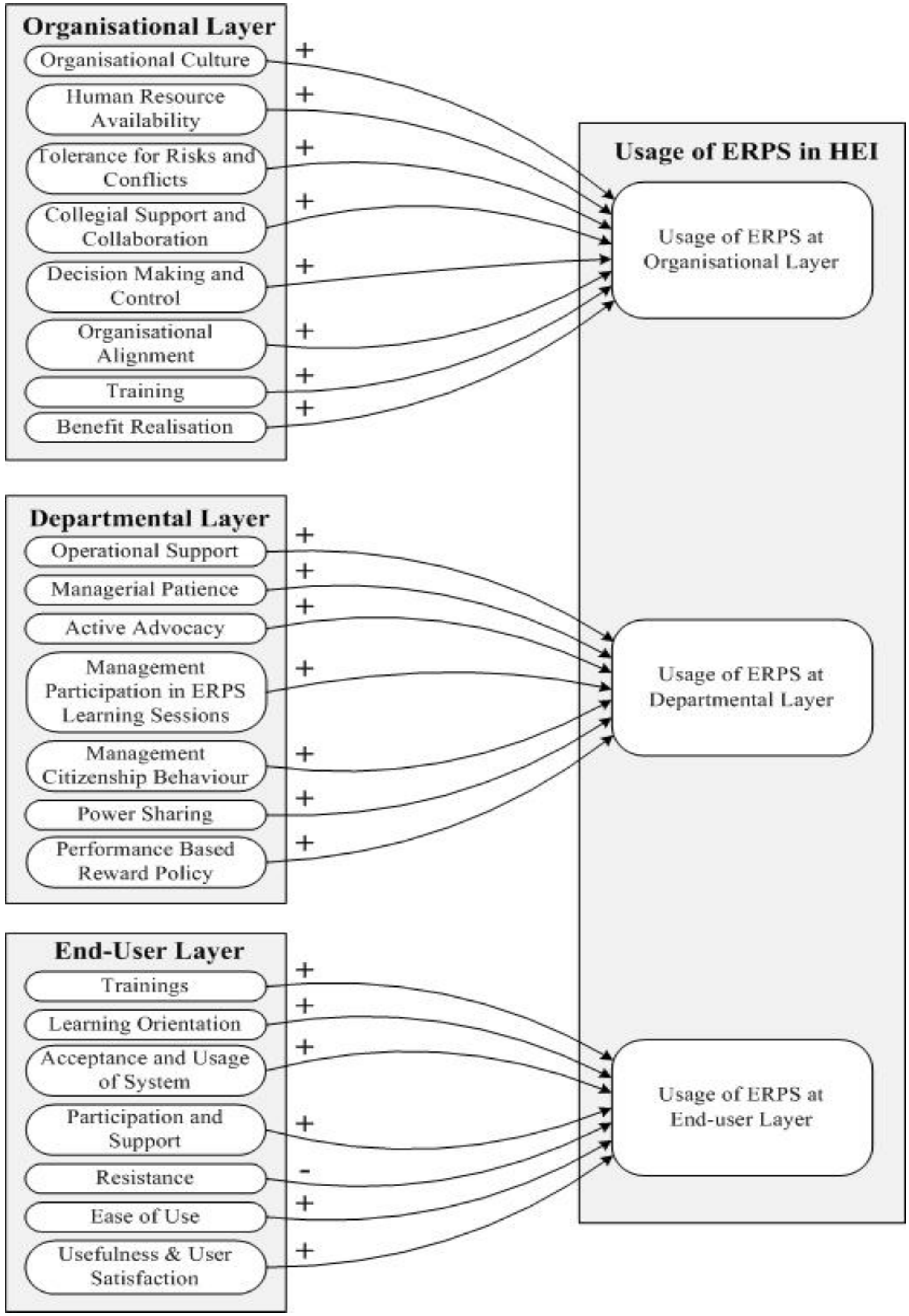

Figure 4.2-Multi-layer usage model for usage of ERPS in HEIs

4.6 Summary

There is scant research on the usage of information systems in the Pakistani context. The aim of the research is to examine the factors that contribute to the usage of ERPS across the organisational, departmental and EU layer in HEIs. Layder's (1993) research map is adapted for the conceptual and methodological framework, and psychometric analysis is employed as a theoretical tool.

Empirical data for the pilot study is collected from one HEI through 131 responses across three distinct questionnaires for each of the three layers. Based on the statistical data analysis in R, the empirical findings have shown that organisational culture, benefits realisation, human resource availability, tolerance for conflicts and risks, collegial support and collaboration, decision making and control, organisational alignment and training affect the usage of ERPS in HEI at the organisational layer. However, setting up learning structure do not contribute to the usage of ERPS in HEI at this layer.

At the departmental layer, the empirical findings show that operational support, managerial patience, active advocacy, management participation in ERPS learning sessions, management citizenship behaviour, power sharing, and performance based reward policy contribute to the usage of ERPS in HEI. Finally, at the end-user layer, the findings show that training, learning orientation, acceptance and usage of system, participation and support, resistance, ease of use and usefulness & user satisfaction contribute to the usage of ERPS in HEI. Thus, the results have supported all the hypotheses proposed. However, behavioural intentions and motivation do not contribute to the usage of ERPS in HEIs at this layer.

Chapter 5. Research Findings

5.1 Introduction

The survey instrument is designed and pilot tested in chapter 4. This chapter discusses the findings of the data collected from all three layers. This chapter also offers sampling, response rate, the reliability of three instruments designed for three layers; organisational, departmental and end-user. Furthermore, descriptive and exploratory statistics are presented along with an analysis of variance, correlations and regression analysis. Finally, overall ERPS usage is presented.

5.2 Sampling and sample size

Sampling is the technique used to choose certain groups from the population (Oliver and Jupp, 2006). Multi-stage sampling is used in this study. The population for this study is HEIs using ERPS in selected geographical area; the area from Bahawalpur to Abbottabad. The distance between these two above mentioned cities of Pakistan is around 580 miles. The area is selected except the cities where access is risky due to terrorism condition of Pakistan (Malik and Zaman, 2013). In the selected geographical area, there are 18 HEIs, from nine cities, fulfilling the condition of ERPS users as this study is focused only on HEIs using ERPS to perform the operational tasks. There are various other HEIs in this area but these HEIs do not have ERPS in the organisations. All the members of the HEIs in the selected geographical area are approached personally.

5.3 Data collection

Due to terrorism in three cities of Pakistan, Peshawar, Karachi and Quetta (Malik and Zaman, 2013), respondents of HEIs working in these cities are not included in primary data collection. Due to a low response rate of online and postal questionnaires distribution methods, the researcher has travelled across nine cities and met all the potential respondents personally to increase the response rate. The personal visits to eighteen HEIs, from March 2015 to August 2015, have increased the response rate. In these HEIs, the questionnaires are distributed in person individually to every potential respondent and responses are collected. These HEIs are in nine cities; Lahore (hometown), Bahawalpur (250 miles), Sahiwal (100 miles), Vehari (180 miles), Faisalabad (120 miles), Islamabad (250 miles), Wah (280 miles), Attock (310 miles) and Abbottabad (330 miles). The HEIs from Lahore city includes the University of the Punjab, University of Lahore, University of Central Punjab and Commission of Science and Technology (COMSATS). The HEIs from Faisalabad included Agriculture University, Government College University and National Textile University. Islamabad city includes Quaid-e-Azam University, COMSATS, Shaheed Zulfiqar Ali Bhutto Institute of Science and Technology (SZABIST), Iqra University and Bahria University. Moreover, Islamia University of Bahawalpur and COMSATS in cities of Sahiwal, Vehari, Attock, Wah and Abbottabad are also visited. In line with the weak research culture of Pakistan, it is expected that the responses from in-person questionnaires be higher than the response rate of the postal/online questionnaires.

5.3.1 Response rate

For this study, data collection is conducted in eighteen HEIs. A list of the potential respondents is developed through the information provided by information technology centres of relevant HEIs. The first layer is the organisational layer, which focuses on the top management involved in the decision making regarding ERPS. In total, 124 questionnaires are distributed by the researcher to senior management position holders and 86 questionnaires are collected back, making a response rate of 69 percent. Secondly, the departmental layer focuses on departmental heads. The total number of questionnaires to departmental heads distributed in eighteen HEIs are 209, of which 144 are received; the response rate at the departmental layer is 68 percent. The number of questionnaires distributed at the end-user layer is 1844 and questionnaires received back are 1121, making a response rate of 61 percent. Figure 5.1 summarizes the primary data collection.

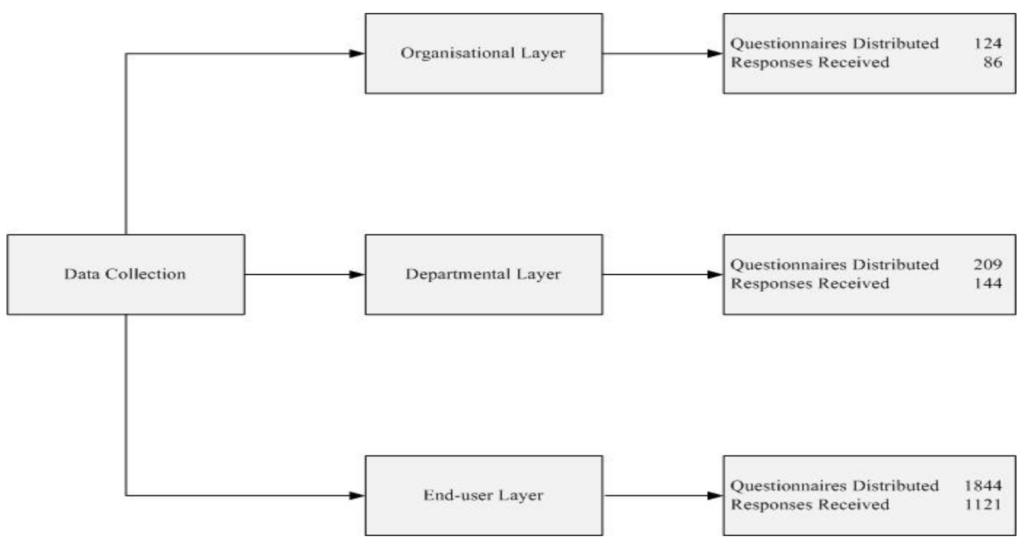

Figure 5.1-Data collection

5.4 Data analysis

This section presents the findings drawn from statistical analysis of the data. This section also offers details of tests such as data screening, reliability issues, demographics of the respondents, measures of central tendency and dispersion, ANOVA, correlations, confirmatory factor analysis and regression analysis.

Overall, 1351 questionnaires from the organisational, departmental and end-user layers are collected for the main study. The questionnaires are paper-based; data is coded and is entered into Microsoft Excel because it is more feasible and efficient to analyse the data electronically than manually (Saunders et al., 2011). A unique anonymized identification number is allocated to each questionnaire (De Vaus, 2002). Later, the data is exported as comma separated values file to be used for analysis using R.

In R, as the first step, data screening is carried out. Cases with missing values are identified across the three layers. Data at the organisational layer and departmental layer do not have any missing values. Out of the 1121 questionnaires collected at the end-user layer; 27 records with missing values are found and are excluded from data collected leaving 1094 clean questionnaires for further data analysis of this layer.

Secondly, for each row standard deviations are calculated to exclude any case having standard deviation zero; if a respondent replied with same answer option to all of the questions in a questionnaire, this questionnaire is excluded from the dataset as not having reliable answers. Only one case at the departmental layer is excluded having standard deviation zero leaving 143 clean questionnaires for analysis at this layer while end-user layer reported to have six cases with zero standard deviation and are also left out. The cases for further analysis on this layer are 1088.

The next step in the analysis is to check the reliability of the scale. Reliability is calculated using Cronbach's alpha. Before conducting further analysis, descriptive statistics are generated (Gorard, 2003). Furthermore, analytical tests such as ANOVA, correlations, confirmatory factor analysis, regression and structural equation modelling are also applied for all three layers. At the organisational layer, respondents have agreed to some extent to the usage of ERPs which have the highest mean value among all factors. At the departmental layer, the majority of the respondents have agreed to a certain extent to the existence of operational support with highest mean value while performance-based reward policies have shown the lowest indicating that HEIs are not giving any rewards for enhanced ERPS usage.

5.4.1 Data screening

Broeck et al., (2005) points out that all studies, no matter how well designed and implemented, have to deal with errors from various sources and their effects on study results. As a standard part of statistical analysis, the data is cleaned up (Gorard, 2003). This includes identifying missing values, outliers and to check normality of data.

5.4.1.1 Missing values

Gorard (2003) suggests that whatever you do, there is likely to be some non-response in your sample. If the data is having a large number of missing values, this can cause several problems. The most apparent problem is that there are not enough data points to run the analyses. The exploratory factor analysis, confirmatory factor analysis and path models require a certain number of data points in order to compute estimates. Additionally, missing data may represent bias issues.

The organisational layer and departmental layer has not shown any missing data in the collected questionnaires however at the end-user layer, out of 1121, 27 records are observed with missing values. It is observed that the missing values are of the question items of the factors and also are missing at random. There are many methods to deal with missing values. One of the most commonly used solution to missing values is case deletion (Acock, 2005). If the missing values follow a complete random pattern, the deletion of cases would yield a random sample (Enders and Bandalos, 2001). In this study, at the end-user layer, the cases with missing values comprises of 2.40 % of dataset. It is suggested to drop the cases with missing values on the grounds that the very small reduction in the dataset is insufficient to cause much bias. Further, it is suggested that the number of complete cases must be sufficient for the selected data analysis technique (Hair et al., 1998). Replacing missing values with mean value or any other method is not used as the new data may produce the results that are not intended to represent the original data results. The researcher has preferred to exclude any records having missing values in it leaving sufficient data set for further analysis.

In total, 27 cases are excluded from the dataset having missing values at end-user layer. Further, cases having standard deviation zero are removed; one from the departmental layer and six from the end-user layer. The clean data available for further analysis is; organisational layer 86, departmental layer 143 and end-user layer 1094.

5.4.2 Reliability of scale

Cronbach’s Alpha is calculated to check the reliability of the research instruments. Cronbach’s alpha is a method to estimate the reliability of a research instrument and is popularly used in estimating the internal consistency of questionnaires. As a rule of thumb, a reliability 0.70 or above is required (Litwin, 1995). The value generally increases when the correlations between the items increase (Mehta, 2010). The organisational layer is represented with sample size 86 and a number of items 47, the departmental layer is having 143 respondents and number of items are 35 and the end-user layer is having a dataset of 1088 cases and 27 items.

5.4.2.1 Organisational layer

At organisational layer, the Cronbach's alpha is calculated for all factors involved at this layer, the number of respondents at this layer is 86. Most of the factors have shown high reliability explaining that the scale will produce stable and consistent results. The ERPS usage has produced maximum reliability value of 0.82 while lowest is 0.66 of tolerance for risks and conflicts showing the strong reliability of all factors in the model. Organisational culture is not included for further analysis as it has shown low reliability 0.56 while organisational alignment 0.67 and tolerance for risks and conflicts 0.66 are retained as these two are closer to 0.70.

The Cronbach's alpha and a number of question items in each factor are presented in Table 5.1.

Table 5.1-Organisational layer Cronbach's alpha

Factors	Cronbach's Alpha	Number of Items
Human Resource Availability	0.70	6
Tolerance for Risks and Conflicts	0.66	6
Collegial Support and Collaboration	0.78	4
Decision Making and Control	0.74	8
Organisational Alignment	0.67	3
Training	0.79	6
Benefit Realisation	0.81	6
Usage of ERPS at Organisational Layer	0.82	2

5.4.2.2 Departmental layer

The next layer is the departmental layer with 143 respondents. All the factors are above 0.70 proving to have strong reliability. The factors of managerial citizenship behaviour and power sharing have maximum reliability with 0.87 while lowest is 0.74 of performance based reward policy showing the strong reliability of all factors in the model. The results of each factor are presented in Table 5.2.

Table 5.2-Departmental layer Cronbach's alpha

Factors	Cronbach's Alpha	Number of Items
Operational Support	0.80	4
Managerial Patience	0.81	5
Active Advocacy	0.83	4
Management Participation in ERPS Learning Sessions	0.80	4
Managerial Citizenship Behaviour	0.87	6
Power Sharing	0.87	5
Performance Based Reward Policy	0.74	5
Usage of ERPS at Departmental Layer	0.85	2

5.4.2.3 End-user layer

At end-user layer, the Cronbach's alpha is calculated for all factors involved at this layer, the dataset consists of 1088 respondents. The factors of training have maximum reliability with 0.93 while lowest is 0.74 of acceptance and usage of the system presenting strong reliability of all factors in the model. Moreover, mean values are also calculated. Learning orientation holds the maximum mean value of 3.93 while lowest is 2.97. The majority of the respondents agreed up to some degree to the existence of learning orientation at this layer. The results of all factors are presented in Table 5.3.

Table 5.3-End-user layer Cronbach's alpha

Factors	Cronbach's Alpha	Number of Items
Training	0.93	7
Learning Orientation	0.83	3
Acceptance and Usage of System	0.74	3
Participation and Support	0.80	2
Resistance	0.76	3
Ease of Use	0.89	3
Usefulness & User Satisfaction	0.89	4
Usage of ERPS at End-user Layer	0.84	2

5.4.3 Demographics

5.4.3.1 Overall

The frequencies and percentages are calculated for the complete data of all three layers collectively. In total, 1317 responses are collected from all layers of 18 HEIs. All the demographic factors are taken into consideration one by one. Firstly, the following table presents the frequency distribution and percentage representation of each HEI. HE01 is having 14 percent representation in the data while the minimum is of one percent of HE15 as presented in Figure 5.2. The blue color represents public sector HEIs while orange represents private sector HEIs.

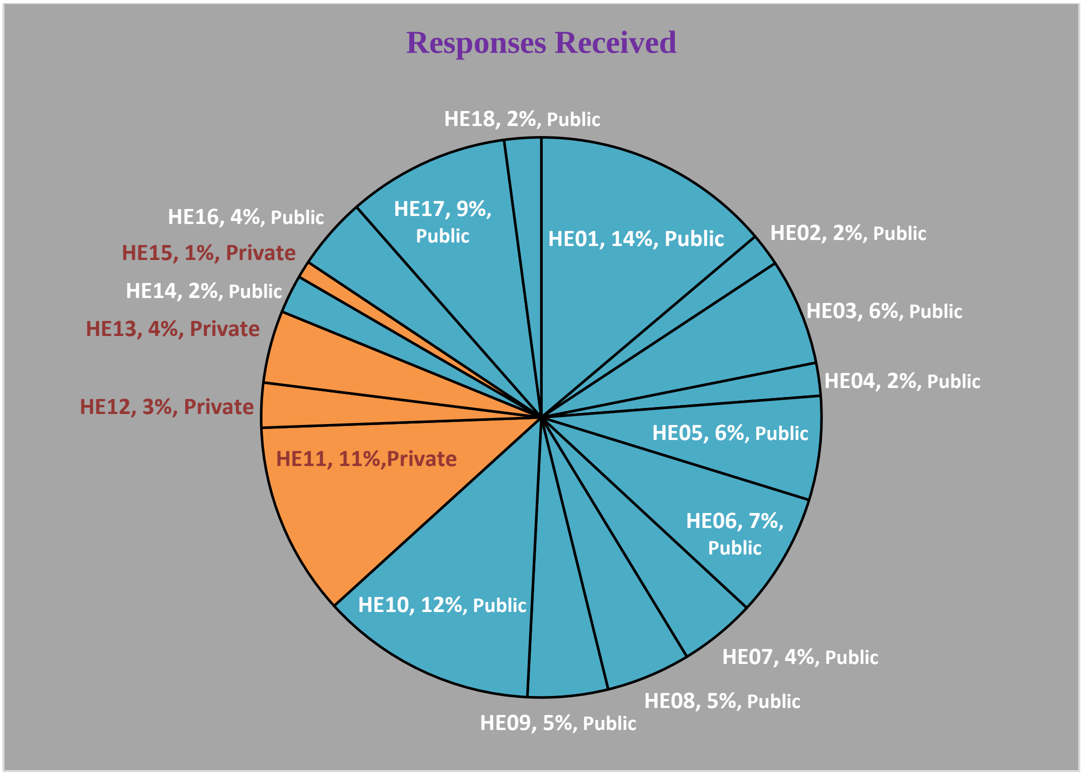

Figure 5.2-Data collection response rate

The 18 HEIs are from two different sectors; public sector and the private sector. Out of the total, 78 percent of the HEIs are from public sector while 22 percent higher education institutions belong to the private sector.

The selected HEIs are from nine cities of Pakistan. The maximum number of HEIs are from the city of Islamabad representing 28 percent of total number of HEIs; Islamabad is the capital city of Pakistan. The 22 percent HEIs are from the city of Lahore; second largest city of Pakistan. Moreover, 17 percent are from Faisalabad city. The rest of the HEIs are one each from cities of Abbottabad, Attock, Bahawalpur, Sahiwal, Vehari and Wah. Figure 5.3 presents the frequency distribution of HEIs based on cities.

Figure 5.3-Data collection cities and HEIs

The users of ERPS belong to two categories; employees and teachers. In total 13 percent representation is of employees' category while the majority is of faculty members of the HEIs. The next category is gender. The majority is male with 72 percent representation of data while female is 28 percent of all data collected from 18 HEIs.

Total of nine categories of age groups are present in the data. The respondents spread indicates that majority are of young age; 83 percent are less than 40 years of age. The representation of the respondents above 50 years of age is seven percent. Figure 5.4 represents the details of age groups.

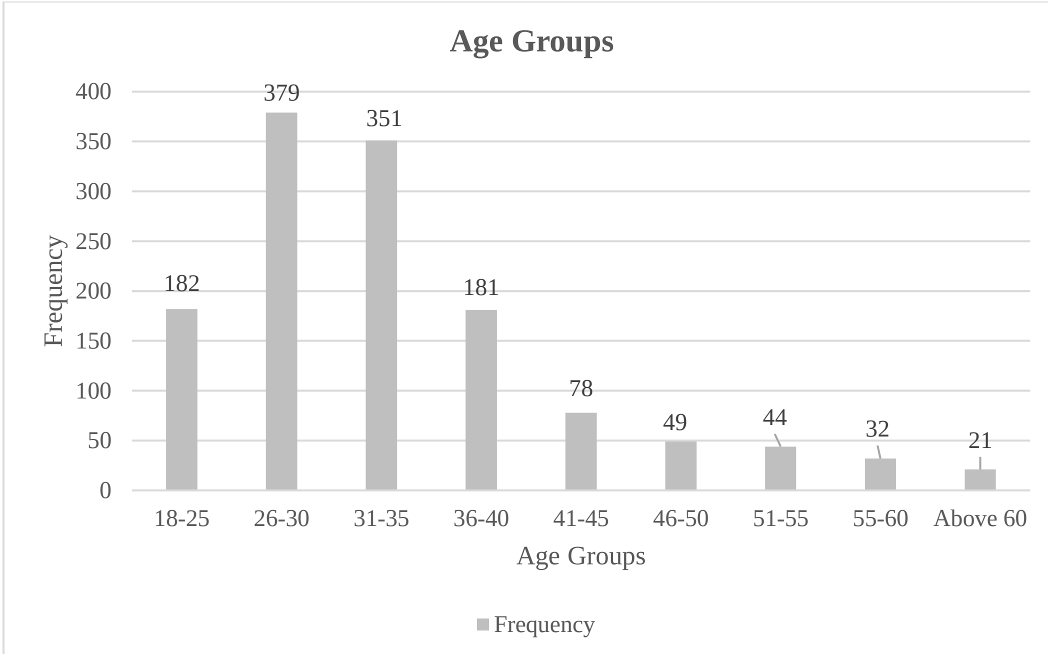

Figure 5.4-Overall frequency distribution of age groups

The respondents have achieved different terminal educational qualifications. There are six categories with respect to highest education achieved. Most of the respondents are highly educated; 32 percent having PhD degrees and 39 percent with MPhil degree. The master degree holders are 20 percent of all the respondents while 10 percent are having graduate degree or lower qualification. Figure 5.5 is representing the data graphically.

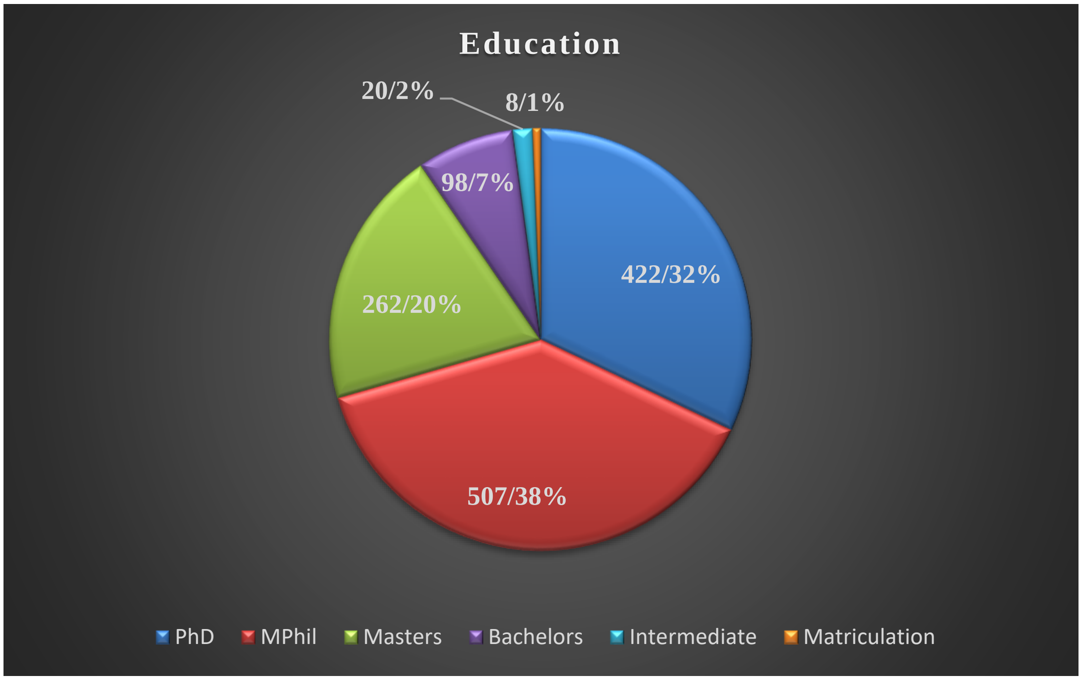

Figure 5.5-Overall highest education achieved

The experience is presented in a number of years. All the data presented in next four categories of experience is in years. Frequency distribution of collected data based on the total experience of respondents describes that majority is having less than five years of total working experience; 44 percent. Similar to total working experience, the majority is having less than five years of experience in higher education institutions while experience in current higher education institution shows that 63 percent of the respondents having less than five years of experience. The details are presented in Table 5.4.

Table 5.4-Overall frequency distribution of working experience

	Total Experience		Experience in HEIs		Experience in Current HEI	
Years	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
0-5	574	43.58	689	52.32	838	63.63
6-10	362	27.49	350	26.58	280	21.26
11-15	183	13.90	134	10.17	114	8.66
16-20	64	4.86	56	4.25	31	2.35
Above 20	134	10.17	88	6.68	54	4.10

Experience using ERPS in the higher education institution shows that 31 percent of the respondents are having less than one year of experience as the systems are relatively new in Pakistan while 26 percent are having more than four years of experience.

5.4.3.2 Layers

The data is collected from 18 HEIs of nine cities across organisational, departmental and end-user layers. The total number of respondents at the organisational layer data is 86. These respondents are the policy makers for ERPS in HEIs. HE01 is having nine percent representation in the data while the minimum is of one percent of HE15. At the departmental layer, out of 144 received questionnaires, one questionnaire is found to have zero standard deviation and thus excluded; remaining 143 questionnaires are used for further analysis. All of the departmental heads are faculty members. At departmental layer, HE01 is having 23 percent representation in the data while the minimum is of one percent of HE04 and HE06. At the end-user layer, 1088 responses are used for further data analysis. The maximum number of respondents at this layer are from HE10 is having 14 percent representation in the data while the minimum is less than one percent of HE15. Frequency distributions and percentage representations of each HEI is given in Table 5.5.

Table 5.5-Frequency distribution of data collected from HEIs

HEIs	Organisational Layer		Departmental Layer		End-user Layer	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
HE01	8	9.30	33	23.08	141	12.96
HE02	4	4.65	2	1.40	19	1.75
HE03	7	8.14	10	6.99	64	5.88
HE04	3	3.49	2	1.40	20	1.84
HE05	4	4.65	5	3.50	70	6.43
HE06	4	4.65	2	1.40	88	8.09

HEIs	Organisational Layer		Departmental Layer		End-user Layer	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
HE07	2	2.33	3	2.10	53	4.87
HE08	4	4.65	3	2.10	57	5.24
HE09	5	5.81	3	2.10	53	4.87
HE10	4	4.65	9	6.29	151	13.88
HE11	5	5.81	12	8.39	130	11.95
HE12	4	4.65	7	4.90	23	2.11
HE13	6	6.98	8	5.59	41	3.77
HE14	6	6.98	6	4.20	17	1.56
HE15	1	1.16	3	2.10	9	0.83
HE16	6	6.98	15	10.49	34	3.13
HE17	7	8.14	13	9.09	103	9.47
HE18	6	6.98	7	4.90	15	1.38

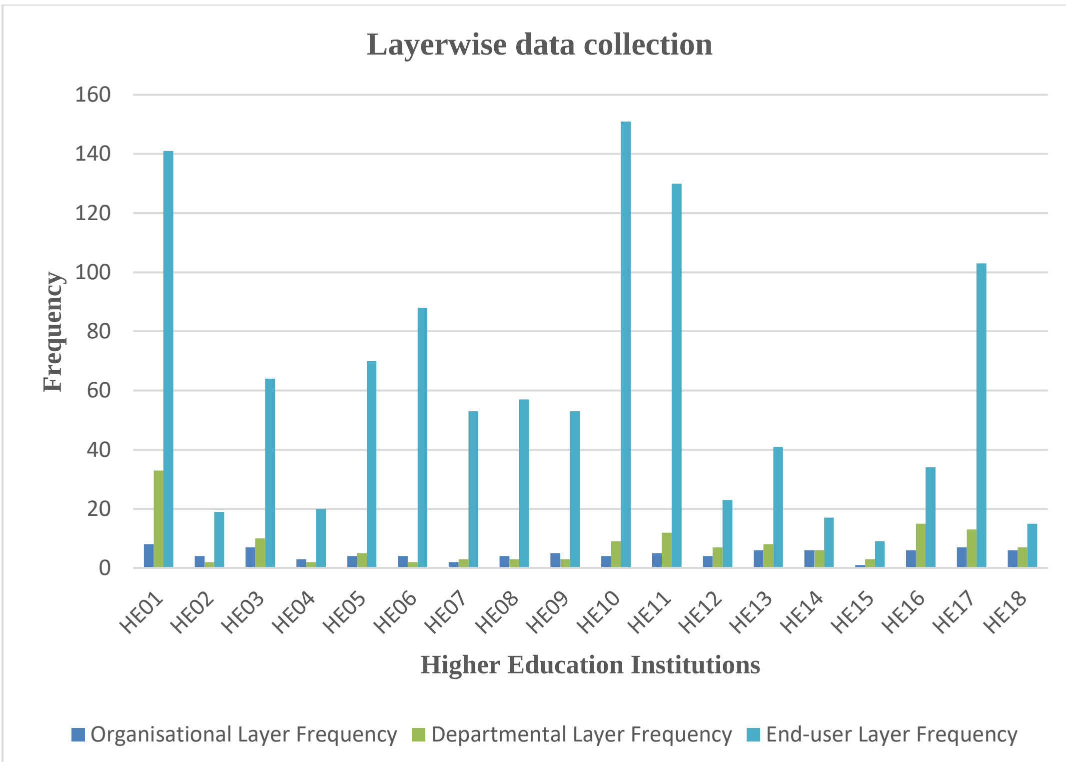

Figure 5.6-Frequency distribution of data collected from HEIs

The 18 HEIs are from two different sectors; public sector and the private sector. Out of the total, 74 percent of the respondents at organisational layer are from public sector higher education institutions while 26 percent from the private sector. The users of ERPS belongs to two categories; employees and teachers. At this layer, all the respondents are employees as this layer respondents are top management officials of the higher education institutions responsible for policy making regarding ERPS usage. At departmental layer, 70 percent respondents are from the public sector and all the respondents are teachers as this layer respondents are only heads of departments and schools of the higher education institutions responsible for implementation of policies regarding ERPS usage. At end-user layer, 78 percent are from public sector higher education institutions while 22 percent from the private sector. In contrast to first two layers, the respondents at this layer are teachers and employees as well; the majority are teachers (92%).

The next category is gender. The majority is male with 90 percent representation of data while female is 10 percent at the organisational layer. Males represent 71 percent of data while female is 29 percent at the departmental layer. Similarly, at the end-user layer, the majority is male with 71 percent representation of data.

Total nine categories of age groups are present in the data. At organisational layer, the highest 31 percent belongs to age group 31-35 years. At departmental layer, the data is almost evenly distributed between categories starting from 26 to 60 years of age. Only one respondent is working as head of the department in the age group 18-25. At end-user layer, the highest 33 percent belongs to age group 26-30 years. The representation of the respondents is shown in detail in Table 5.6.

Table 5.6-Frequency distribution of age groups

Age Groups	Organisational Layer		Departmental Layer		End-user Layer	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
21-25	2	2.33	1	0.70	179	16.45
26-30	11	12.79	12	8.39	356	32.72
31-35	27	31.40	20	13.99	304	27.94
36-40	18	20.93	25	17.48	138	12.68
41-45	5	5.81	16	11.19	57	5.24
46-50	2	2.33	20	13.99	27	2.48
51-55	8	9.30	27	18.88	9	0.83
55-60	9	10.47	19	13.29	4	0.37
Above 60	4	4.65	3	2.10	14	1.29

The respondents have achieved different terminal educational qualifications. At organisational layer, all the respondents are highly educated having a master degree and above; 29 percent having PhD degrees and 35 percent with MPhil degrees. At departmental layer, the respondents at this layer are heads of academic units and most of them are highly educated; 83 percent having PhD degrees and 16 percent with MPhil degree. The master degree holders are less than two percent of all the respondents and no one is having any qualification less than masters' degree. At end-user layer, the respondents have achieved different terminal educational qualifications. Similar to top two layers, most of the respondents at end-user layer are also highly educated; 26 percent having PhD degrees and 42 percent with MPhil degree. The master degree holders are 22 percent of all the respondents while 11 percent are having graduate or lower qualification. Table 5.7 is showing the details.

Table 5.7-Frequency distribution of education

Education	Organisational Layer		Departmental Layer		End-user Layer	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
PhD	25	29.07	118	82.52	279	25.64
MPhil	30	34.88	23	16.08	454	41.73
Masters	26	30.23	2	1.40	234	21.51
Bachelors	5	5.81	0	0.00	93	8.55
Intermediate	0	0.00	0	0.00	20	1.84
Matriculation	0	0.00	0	0.00	8	0.74

The experience is presented in a number of years. All the data presented in next four categories of experience is in years. Frequency distribution of collected data based on the total experience of respondents describes that majority is having 6-10 years of total working experience; 37 percent. At departmental layer, that majority is having more than 20 years of total working experience; 44 percent. At end-user layer, 50 percent of the respondents are having less than five years of total working experience. The details are presented in Table 5.8.

Table 5.8-Frequency distribution of total experience

Total Experience	Organisational Layer		Departmental Layer		End-user Layer	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
0-5	16	18.60	15	10.49	543	49.91
6-10	32	37.21	21	14.69	309	28.40
11-15	8	9.30	32	22.38	143	13.14
16-20	6	6.98	12	8.39	46	4.23
Above 20	24	27.91	63	44.06	47	4.32

At organisational layer, total working experience in higher education institutions states that majority is having less than five years of experience in this category; 34 percent. At departmental layer, the majority is having more than 20 years of experience in this category. At end-user layer, the majority of the respondents, 59 percent, is having less than five years of experience in this category. The details are given in Table 5.9.

Table 5.9-Frequency distribution of experience in HEIs

Experience in HEIs	Organisational Layer		Departmental Layer		End-user Layer	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
0-5	29	33.72	20	13.99	640	58.82
6-10	24	27.91	25	17.48	301	27.67
11-15	7	8.14	29	20.28	98	9.01
16-20	9	10.47	14	9.79	33	3.03
Above 20	17	19.77	55	38.46	16	1.47

Experience in current higher education institution states that 45 percent of the respondents are having less than five years of experience at the organisational layer. At departmental layer, 29 percent of the respondents having more than 20 years of experience while eight percent are having more than 16 years of experience. At end-user layer, 70 percent of the respondents having less than five years of experience. Table 5.10 presents the details.

Table 5.10-Frequency distribution of experience in current HEI

Experience in Current HEI	Organisational Layer		Departmental Layer		End-user Layer	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
0-5	39	45.35	40	27.97	759	69.76
6-10	23	26.77	23	16.08	234	21.51
11-15	11	12.79	26	18.18	77	7.08
16-20	7	8.14	12	8.39	12	1.10
Above 20	6	6.98	42	29.37	6	0.55

Experience using ERPS in the higher education institution shows that the majority is having more than four years of experience; 49 percent at the organisational layer, 37 percent at the departmental layer, 22 percent at the end-user layer. Table 5.11 is presenting the frequency distributions.

Table 5.11-Frequency distribution of experience using ERPS

Experience using ERPS	Organisational Layer		Departmental Layer		End-user Layer	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Less than 1	10	11.63	22	15.38	374	34.38
Less than 2	10	11.63	21	14.69	209	19.21
Less than 3	16	18.60	23	16.08	151	13.88
Less than 4	8	9.30	24	16.78	111	10.20
Above 4	42	48.84	53	37.06	243	22.33

Table 5.12 provides an overall summary of demographic statistics of organisational, departmental and end-user layers.

Table 5.12-Demographic statistics

Layer	Frequency	Male		Age (50+)		PhD		Experience in Years: Overall (20+ Years)		In HEIs (20+ Years)		Using ERPS (4+ Years)	
Org	86	77	90%	21	25%	25	29%	24	28%	17	20%	42	50%
Dep	143	101	71%	49	35%	118	83%	63	44%	55	39%	42	29%
End-user	1088	771	71%	27	3%	279	26%	47	4%	16	2%	243	22%

5.4.4 Exploratory data analysis

Before conducting further analysis, means and standard deviations of the data are calculated (Gorard, 2003). Research data can be summarised in statistical measures of central tendency and dispersion (Kothari, 2004). To get to know the dataset before the serious analysis is conducted, means and standard deviations are calculated (Gorard, 2003). Mean is the total of all values divided by the number of cases (Gorard, 2003). Standard deviation gives an overall idea of how spread out the values are from the mean (Gorard, 2003).

For the data analysis, firstly, the standard deviation of each row is calculated on every layer. At the organisational layer, no case having zero standard deviation is reported thus all cases 86 are used for further analysis; while at the departmental layer, one case has a zero standard deviation and thus excluded from the dataset, making the sample size at this layer 143. The end-user layer has reported having six such cases and data to be used consists of 1088 cases.

At the organisational layer, respondents have agreed to some extent to the usage of ERPS which has the highest mean value among all variables; while lowest is of organisational alignment. At the departmental layer, the majority of the respondents have agreed to a certain level of agreement to the existence of operational support with highest mean value while performance-based reward policies have shown the lowest. The highest deviation from mean is observed in ERPS usage. At the end-user layer, participation and support are observed as below the level of the agreement while training is reported as neutral. However, learning orientation and resistance have proved their presence as presented in Table 5.13.

Table 5.13-Descriptive statistics

Organisational Layer	Mean	SD.	Departmental Layer	Mean	SD.	End-user Layer	Mean	SD.
Human Resource Availability	3.78	0.56	Operational Support	3.95	0.67	Training	3.00	0.99
Tolerance for Risks and Conflicts	3.79	0.52	Managerial Patience	3.92	0.68	Learning Orientation	3.93	0.73
Collegial Support and Collaboration	3.85	0.69	Active Advocacy	3.90	0.66	Acceptance and Usage of System	3.85	0.75
Decision Making and Control	3.81	0.50	Management Participation in ERPS Learning Sessions	3.56	0.71	Participation and Support	2.97	0.98
Organisational Alignment	3.72	0.66	Managerial Citizenship Behaviour	3.61	0.70	Resistance	3.89	0.74
Training	3.82	0.63	Power Sharing	3.70	0.76	Ease of Use	3.65	0.88
Benefit Realisation	3.82	0.61	Performance Based Reward Policy	3.49	0.68	Usefulness & User Satisfaction	3.71	0.80
Usage of ERPS	3.91	0.87	Usage of ERPS	3.86	0.89	Usage of ERPS	3.50	0.96

5.4.5 Tests of demographic differences

T-test and ANOVA are defined in Section 4.4.5. The independent variables for all layers are sector, category, gender, age, highest education achieved, total experience, experience in HEIs, experience in current HEI and experience using ERPS. Independent variables are tested for significant difference with the dependent variables for each layer explained in the relevant sections.

5.4.5.1 Organisational Layer

At the organisational layer, independent variables are same as described in Section 5.4.5 while the dependent variables for the organisational layer are human resource availability, tolerance for risks and conflicts, collegial support and collaboration, decision making and control, organisational alignment, training, benefit realisation and usage of ERPS at organisational layer. The results have shown the significant differences among categories in certain demographic factors. Public and private sector HEIs have shown significant variations in human resource availability, collegial support and collaboration, decision making and control, training and usage of ERPS at the organisational layer. The respondents at this layer are only from one category of employees. Furthermore, there are no significant differences observed in gender and age groups. Highest education achieved has shown differences in opinion of respondents in human resource availability and tolerance for risks and conflicts. Total experience of respondents has shown significant impact of education regarding human resource availability and decision making and control. Experience in HEIs and experience in current HEI has also shown impact on training while experience using ERPS has a difference of respondents' opinion regarding usage of ERPS at the organisational layer. The detailed results are presented in Appendix A-Tables A.2-A.10 while the significant differences observed are presented in Table 5.14.

Table 5.14-Organisational layer demographic differences

Independent Variables	Dependent Variables							
	HRA	**TRC**	**CSC**	**DMC**	**OA**	**TR**	**BR**	**UO**
Sector	✓		✓	✓		✓		✓
Category								
Gender								
Age								
Highest Education Achieved	✓	✓						
Total Experience	✓			✓				
Experience in HEIs						✓		

Independent Variables	Dependent Variables							
	HRA	TRC	CSC	DMC	OA	TR	BR	UO
Experience in Current HEI						✓		
Experience using ERPS								✓

✓ *indicates there are significant differences among categories - $p < 0.05$*

Legend organisational layer

HRA	Human Resource Availability	**DMC**	Decision Making and Control
TRC	Tolerance for Risks and Conflicts	**OA**	Organisational Alignment
CSC	Collegial Support and Collaboration	**TR**	Training
UO	Usage of ERPS at Organisational Layer	**BR**	Benefit Realisation

5.4.5.2 Departmental Layer

At the departmental layer, independent variables are same as described in Section 5.4.5 while the dependent variables are operational support, managerial patience, active advocacy, management participation in ERPS learning sessions, managerial citizenship behaviour, power sharing, performance based reward policy and usage of ERPS at departmental layer. The demographic difference on departmental layer has produced more demographic differences in categories than the organisational layer. Participation and support, managerial patience and usage of ERPS at departmental layer have shown the differences in all demographic categories except gender and category as a category on this layer are having only teachers as respondents. The results are presented in Appendix A-Tables A.11-A.19 while the significant differences observed are presented in Table 5.15.

Table 5.15-Departmental layer demographic differences

Independent Variables	Dependent Variables							
	OS	MP	AA	MPLS	MCB	PS	PBRP	UD
Sector	✓	✓				✓		✓
Category								

Independent Variables	Dependent Variables							
	OS	MP	AA	MPLS	MCB	PS	PBRP	UD
Gender								
Age	✓	✓	✓			✓		✓
Highest Education Achieved		✓				✓		✓
Total Experience	✓	✓	✓			✓		✓
Experience in HEIs	✓	✓	✓		✓	✓	✓	✓
Experience in Current HEI	✓	✓			✓	✓	✓	✓
Experience using ERPS	✓	✓	✓		✓	✓		✓

✓ *indicates there are significant differences among categories - $p < 0.05$*

Legend departmental layer

OS	Operational Support	**MCB**	Managerial Citizenship Behaviour
MP	Managerial Patience	**PS**	Power Sharing
AA	Active Advocacy	**PBRP**	Performance Based Reward Policy
MPLS	Management Participation in ERPS Learning Sessions		
UD	Usage of ERPS at Departmental Layer		

5.4.5.3 End-User Layer

The end-user layer has also produced significant differences regarding the opinion of respondents across different categories. At this layer, independent variables are same as described in Section 5.4.5 while the dependent variables for the end-user layer are training, learning orientation, acceptance and usage of system, participation and support, resistance, ease of use, user satisfaction and usefulness and usage of ERPS at end-user layer. The category has both respondents; employees and teachers. The differences in the category are observed in training, learning orientation and, user satisfaction and usefulness. Gender has expressed difference only in ease of use. The detailed results are presented in Appendix A-Tables A.20-A.28 while the significant differences observed are presented in Table 5.16.

Table 5.16-End-user layer demographic differences

Independent Variables	Dependent Variables							
	TR	**LO**	**AUS**	**PS**	**RE**	**EOU**	**USF**	**UE**
Sector	✓	✓					✓	
Category	✓	✓				✓		
Gender						✓		
Age	✓	✓	✓	✓	✓		✓	
Highest Education Achieved		✓	✓		✓	✓	✓	✓
Total Experience	✓	✓	✓		✓			
Experience in HEIs	✓				✓			
Experience in Current HEI	✓			✓				
Experience using ERPS	✓	✓	✓		✓		✓	

✓ *indicates there are significant differences among categories - $p < 0.05$*

Legend end-user layer

TR	Training	**RE**	Resistance
LO	Learning Orientation	**EOU**	Ease of Use
AUS	Acceptance and Usage of System	**USF**	User satisfaction and usefulness
PS	Participation and Support		
UE	Usage of ERPS at End-user Layer		

In the context of the thesis, the objective of performing ANOVA is to explore differences in response of ERPS users of all proposed variables regarding demographic factors of HEIs working in public or private sector, respondent is employee or faculty member, male or female, different age groups, education achieved and various categories of experiences. This is important to understand the way people think while working in different sectors, having difference in gender, having difference in experiences in years etc. The application of ANOVA is significant to observe the differences in thinking of the respondents. At all three layers, ANOVA suggests that there are differences observed in sector, highest education achieved, total experience, experience in HEIs, experience in current HEI and experience using ERPS. The culture of private and public sector HEIs is different in many aspects like private sector HEIs are for profit organisations.

Moreover, as the respondent obtains higher education, the way of thinking of the person may change. Similarly, gaining more experience may also do that. These results of all three layers helps in understanding the ERPS usage in education sector. ERPS users of public sector HEI and private sector HEI have difference on opinion. Similar results are observed in education of the respondents and all categories of experiences. On the contrary, category of respondents and gender has shown significant results only at the end-user layer while organisational and departmental layer have produced no difference regarding the respondent being employee or faculty member and male or female. Furthermore, respondents with different age groups think differently regarding ERPS usage on departmental and end-user layers.

5.4.6 Correlations

Simple statistics can present important information but it is also very important to examine relationships of the variables, especially in the social sciences (Samuel and Okey, 2015). Correlational results can play a significant role in the development and testing of theoretical models. The nature of bivariate relationships is also an important consideration in the correlation analysis that will proceed to further advanced analysis like factor analysis and structural equation modelling (Duncan, 1966). Correlational analysis has played a significant role in quantitative research by exploring the nature of relationships among variables. Based on the results, non-significant variables may be removed for further analysis while focusing only on related variables (Samuel and Okey, 2015). Furthermore, while taking a low p value into consideration may lead to the rejection of null hypothesis (Fenton and Neil, 2012).

5.4.6.1 Organisational layer

At the organisational layer, correlations are computed between all pairs of variables and all the factors are observed to be correlated moderately with each other. It is important to mention that all variables have significant correlations among them. The highest correlation 0.78** is observed between tolerance for risks and conflicts, and decision making and control, while lowest correlation is 0.44** between training and decision making and control. Decision making and control has shown strong correlation with collegial support and collaboration, and tolerance for risks and conflicts, while all other factors are moderately correlated as shown in Table 5.17. All the factors have shown highly significant correlations among them and will be retained for the further analysis.

Table 5.17-Organisational layer correlation matrix

Factors	HRA	TRC	CSC	DMC	OA	TR	BR
Human Resource Availability	1						
Tolerance for Risks and Conflicts	0.59**	1					
Collegial Support and Collaboration	0.67**	0.68**	1				
Decision Making and Control	0.56**	0.78**	0.75**	1			
Organisational Alignment	0.47**	0.62**	0.55**	0.51**	1		
Training	0.52**	0.52**	0.59**	0.44**	0.61**	1	
Benefit Realisation	0.61**	0.55**	0.45**	0.46**	0.60**	0.47**	1

*** $p < 0.01$*

5.4.6.2 Departmental layer

Similar to the top layer, at the departmental layer, correlations are computed between all pairs of variables. The results are showing that there is a significant correlation among all the factors at the departmental layer. The strongest correlation

0.65** is observed between managerial patience and power sharing, while weakest correlation is 0.33** between active advocacy and management participation in ERPS learning sessions. All the factors have shown highly significant and moderate correlations among them as presented in Table 5.18 supporting the theoretical model presented in Chapter 4.

Table 5.18-Departmental layer correlation matrix

Factors	OS	MP	AA	MPLS	MCB	PS	PBRP
Operational Support	1						
Managerial Patience	0.58**	1					
Active Advocacy	0.54**	0.59**	1				
Management Participation in ERPS Learning Sessions	0.41**	0.38**	0.33**	1			
Managerial Citizenship Behaviour	0.52**	0.57**	0.59**	0.39**	1		
Power Sharing	0.58**	0.65**	0.54**	0.48**	0.53**	1	
Performance Based Reward Policy	0.42**	0.57**	0.43**	0.46**	0.50**	0.55**	1

*** p < 0.01*

5.4.6.3 End-user layer

At the end-user layer, correlations are computed. Correlation among all the factors is significant while most of the correlations among factors are observed as weak. The highest correlation 0.64** is observed between ease of use and usefulness and user satisfaction, while lowest correlation is 0.09** between training and resistance evidently relating to literature. Similarly, resistance has shown low correlation with participation and support. Highly significant correlations among variables is confirming all variables present in theoretical model and will be used for the further analysis of regression and structural equation modelling. The details are given in Table 5.19.

Table 5.19-End-user layer correlation matrix

Factors	TR	LO	AUS	PS	RE	EOU	USF
Training	1						
Learning Orientation	0.24**	1					

Factors	TR	LO	AUS	PS	RE	EOU	USF
Acceptance and Usage of System	0.22**	0.50**	1				
Participation and Support	0.33**	0.22**	0.26**	1			
Resistance	0.09**	0.44**	0.51**	0.11**	1		
Ease of Use	0.29**	0.29**	0.47**	0.29**	0.34**	1	
Usefulness and User Satisfaction	0.29**	0.44**	0.58**	0.36**	0.47**	0.64**	1

*** $p < 0.01$*

5.4.7 Regression analysis

The independent variables determined at the organisational layer are human resource availability, tolerance for conflicts and risks, collegial support and collaboration, decision making and control, organisational alignment, training and benefits realisation. The factors identified for the departmental layer are operational support, managerial patience, active advocacy, management participation in ERPS learning sessions, managerial citizenship behaviour, power sharing and performance-based reward policy. Finally, factors specific to the end-user layer are training, learning orientation, acceptance and usage of system, participation and support, resistance, ease of use, and usefulness and user satisfaction.

5.4.7.1 Organisational layer

Regression is carried out at the organisational layer to find the best suitable model for this layer. Regression analysis has produced seven models. Each model presents a different number of predictors with varying values of r-square and adjusted r-square. The model with maximum r-square value 0.59 and maximum adjusted r-squared value 0.56 is selected as the best fitting model. The selected model has seven predictors and is explaining 56 percent of the variation in the usage of ERPS for the organisational layer. Details are presented in Table 5.20.

Table 5.20-Organisational layer regression

No. of Factors	R-square	Adjusted R-square	HR	TO	CS	DM	OA	TR	BR
1	0.374	0.367	✓						
2	0.500	0.488	✓				✓		
3	0.541	0.524	✓	✓			✓		
4	0.564	0.542	✓	✓			✓	✓	
5	0.581	0.554	✓	✓			✓	✓	✓
6	0.583	0.551	✓	✓	✓		✓	✓	✓
7	0.588	0.556	✓	✓	✓	✓	✓	✓	✓

✓ *indicates that the factor is included in the model*

5.4.7.2 Departmental layer

Regression is also carried out at the departmental layer; regression analysis presented seven models. Each model has a different number of predictors with varying values of r-square and adjusted r-square. The model with maximum r-square value 0.50 and adjusted r-squared value 0.48 is selected as the best-fitting model. The selected model has seven predictors and explained 48 percent of the variation in the usage of ERPS for the departmental layer. The adjusted r-squared is observed on lower side. However it is expected to improve after SEM is applied on the same data as SEM is more sophisticated technique. Details are presented in Table 5.21.

Table 5.21-Departmental layer regression

No. of Factors	R-square	Adjusted R-square	OS	MP	AA	ME	MC	PS	RP
1	0.358	0.353		✓					
2	0.445	0.437		✓			✓		
3	0.469	0.459		✓		✓	✓		
4	0.486	0.470	✓	✓		✓	✓		
5	0.494	0.477	✓	✓	✓	✓	✓		
6	0.497	0.475	✓	✓	✓	✓	✓	✓	
7	0.498	0.481	✓	✓	✓	✓	✓	✓	✓

✓ *indicates that the factor is included in the model*

5.4.7.3 End-user layer

Similar to top two layers, regression is carried out at the end-user layer; regression analysis has presented seven models. The model with maximum r-square value 0.48 and adjusted r-squared value 0.47 is selected as the best-fitting model. The selected model has seven predictors and explained 47 percent of the variation in the usage of ERPS for the organisational layer. Details are presented in Table 5.22.

Table 5.22-End-user layer regression

No. of Factors	R-square	Adjusted R-square	TR	LO	AC	PA	RE	EO	UU
1	0.349	0.349						✓	
2	0.417	0.416						✓	✓
3	0.450	0.448	✓					✓	✓
4	0.466	0.464	✓				✓	✓	✓
5	0.470	0.468	✓		✓		✓	✓	✓
6	0.472	0.469	✓		✓	✓	✓	✓	✓
7	0.475	0.470	✓	✓	✓	✓	✓	✓	✓

✓ *indicates that the factor is included in the model*

The results of regression analysis have addressed the objectives of the study by identifying the influence of the factors on the usage of ERPS. However, as the first generation multivariate statistical analysis technique, the use of regression is limited in predicting the usage of ERPS on the basis of change in the independent variables. The next chapter utilises SEM, which is a second generation multivariate statistical analysis technique, to further investigate the effect of the selected factors on the usage of ERPS. Instead of simply using average scores for each variable as is the case in regression analysis, SEM is an advanced statistical technique that deals with the scores of individual question items to calculate an array of results.

SEM technique help to define a model to include the independent variables and the question items relevant to each variable.

Regression is run as initial analysis just to confirm the inclusion of variables in the proposed models and to determine that inclusion of all the factors resulted in a superior prediction of ERPS usage than the inclusion of a smaller set. Therefore, the results of regression analysis have been used to establish the basic validity of the model while SEM is applied in next chapter to obtain the detailed results. The next section presents overall ERPS usage in HEIs.

5.5 Overall ERPS usage

To compare the usage of ERPS among HEIs, the small dataset of each HEI is a limitation as the application of SEM techniques is not expected to produce any results when applied to individual data sets of HEIs. Therefore, for individual HEIs, the comparison between HEIs is presented based on the mean values of the question items used to measure ERPS usage at organisational, departmental and end-user layers. The following two questions are used to measure ERPS usage at each layer; organisational, departmental and end-user:

> Question 1: In my opinion, ERPS usage in my university is at excellent level
> Question 2: I am satisfied with level of overall ERPS usage

Overall, the results reveal variations. According to top management, HE02 is holding maximum ERPS usage while the same is presenting lowest ERPS usage at departmental and end-user layers indicating there is a gap in the policy making and extracting results from the policies devised to increase ERPS usage. HE05 proved to be stable in ERPS usage at all layers having maximum usage at organisational and end-user layers and seen to be the second best at the departmental layer. Moreover, HE05 is also on top with a mean value of 4.29 of all three layers while the minimum value of 3.05 belongs to HE04. HE02 is on second agreeing to usage in the organisation with mean value 4.00.

In Tables 5.23, 5.26, 5.27 and 5.28, percentage relative to overall mean value is indicating percentage change of relevant higher education institution considering overall mean, 100 percent, as a reference point. Keeping in view the ERPS at the organisational layer, 50 percent of HEIs are above usage meanwhile at the departmental layer, only six are above. Moreover, eight HEIs are above average ERPS usage at the end-user layer. Out of 18, seven HEIs are above or equal to the mean making it 39 percent of all HEIs while 61 percent are below the average ERPS usage. The details are presented in Table 5.23 and Figure 5.7.

Table 5.23-Overall ERPS usage

HEI	Organisational Layer	Departmental Layer	End-user Layer	Overall Mean	Percentage relative to overall mean value
ALL	**3.91**	**3.86**	**3.50**	**3.76**	**100**
HE01	4.38	4.06	3.56	4.00	106
HE02	4.63	2.75	2.55	3.31	88
HE03	3.43	4.50	3.72	3.88	103
HE04	3.00	3.25	2.90	3.05	81
HE05	4.63	4.30	3.94	4.29	114
HE06	2.25	3.75	3.34	3.11	83
HE07	3.50	3.50	2.99	3.33	89
HE08	3.50	3.83	3.76	3.70	98
HE09	3.70	2.83	3.54	3.36	89
HE10	4.13	3.67	3.69	3.83	102
HE11	3.70	3.17	3.65	3.51	93
HE12	4.25	3.79	3.50	3.85	102
HE13	4.42	3.56	3.11	3.70	98
HE14	4.58	3.25	2.88	3.57	95
HE15	4.00	2.83	3.39	3.41	91
HE16	3.67	4.30	3.01	3.66	97
HE17	3.71	4.15	3.51	3.79	101
HE18	4.08	4.21	2.97	3.75	100

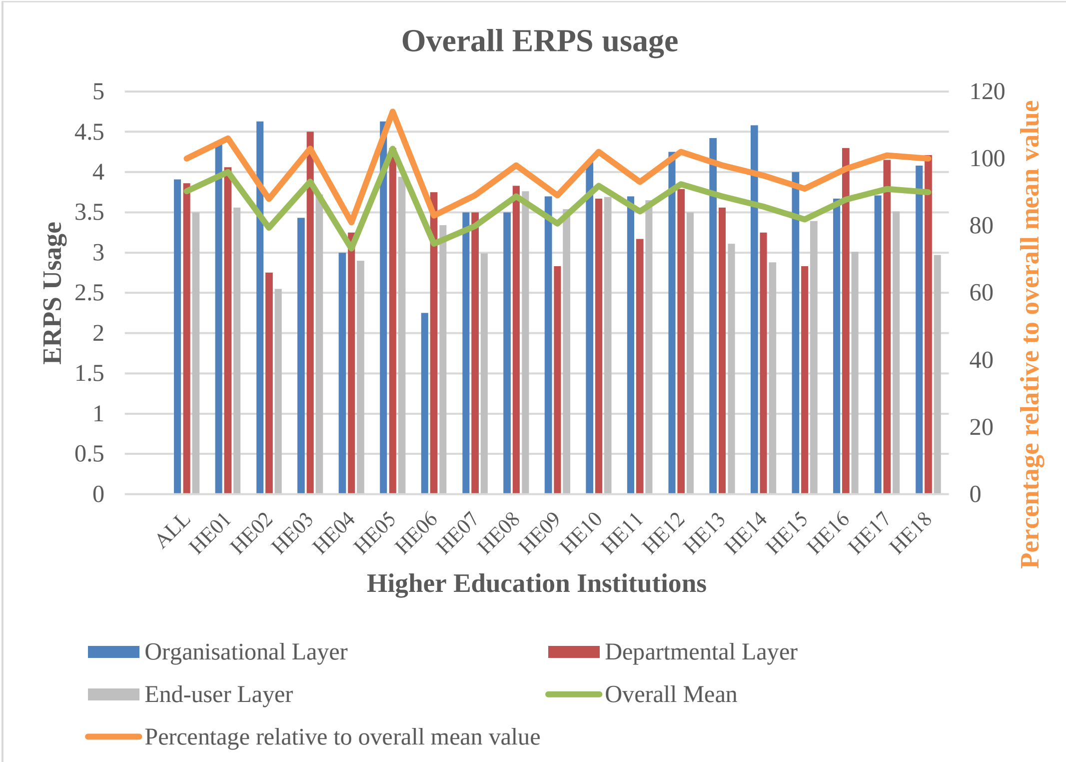

Figure 5.7-Overall ERPS usage

The significant difference is observed between public and private sector HEIs at organisational layer regarding ERPS usage. The private sector policy makers are satisfied with ERPS usage while satisfaction of departmental heads and end-users is not matching as of the organisational layer respondents. In public sector, the departmental heads are more satisfied with ERPS usage while end-users fall at lowest level of satisfaction. The details are presented in Table 5.24.

Table 5.24-Overall ERPS usage sector wise

Sector	Organisational Layer	Departmental Layer	End-user Layer	Overall Mean
Public	3.79	4.02	3.51	3.77
Private	4.25	3.50	3.43	3.73

The data is also analyzed province wise. The data is collected from three provinces of Pakistan; Federal Capital, Khyber Pakhtunkhwa and Punjab. At the organisational layer, highest mean of ERPS usage is observed in Federal Capital and the same is observed in overall mean of ERPS usage in HEIs. On the contrary, the end-users of Federal Capital are least satisfied with ERPS usage in the HEIs. This indicates that there are gaps between the top layer and end-users that needs to be addressed. The details are presented in Table 5.25.

Table 5.25-Overall ERPS usage province wise

Province	Organisational Layer	Departmental Layer	End-user Layer	Overall Mean
Federal Capital	4.00	3.38	3.22	3.91
Khyber Pakhtunkhwa	3.50	3.83	3.76	3.86
Punjab	3.90	3.95	3.53	3.50

5.5.1 Organisational layer

The total number of responses at organisational layer are 86 from 18 HEIs. The overall mean of first question item is 3.88 and mean of question two is reported as 3.93. The mean of both questions of usage of all HEIs is 3.91 showing inclination to the agreement by the users of ERPS system. In a comparison of ERPS usage among HEIs at organisational layer; two HEIs, HE02 and HE05, share similar mean values of 4.63 and has shown the maximum usage of ERPS. The lowest usage of ERPS is observed in HE06 with mean value 2.25 showing disagreement to the presence of ERPS usage in the HEI. At organisational layer, nine HEIs are above the reference point. Table 5.26 and Figure 5.8 explain the details.

Table 5.26-Organisational layer ERPS usage

HEI	No of Responses	Mean Q1	Mean Q2	Overall Mean	Percentage relative to overall mean value
ALL	**86**	**3.88**	**3.93**	**3.91**	**100**
HE01	8	4.38	4.38	4.38	112
HE02	4	4.75	4.50	4.63	118
HE03	7	3.43	3.43	3.43	88
HE04	3	3.00	3.00	3.00	77
HE05	4	4.50	4.75	4.63	118
HE06	4	2.50	2.00	2.25	58
HE07	2	3.00	4.00	3.50	90
HE08	4	3.25	3.75	3.50	90
HE09	5	3.80	3.60	3.70	95
HE10	4	4.25	4.00	4.13	106
HE11	5	3.80	3.60	3.70	95
HE12	4	4.50	4.00	4.25	109
HE13	6	4.50	4.33	4.42	113
HE14	6	4.50	4.67	4.58	117
HE15	1	4.00	4.00	4.00	102
HE16	6	3.67	3.67	3.67	94
HE17	7	3.29	4.14	3.71	95
HE18	6	4.00	4.17	4.08	105

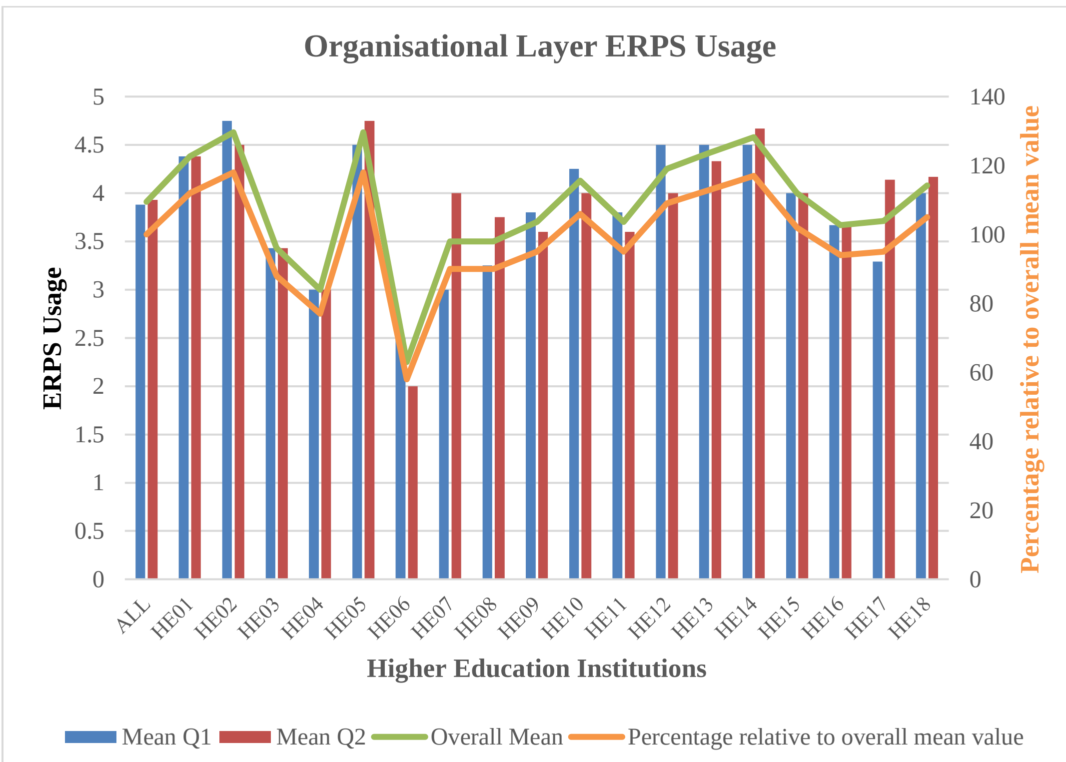

Figure 5.8-Organisational layer ERPS usage

5.5.2 Departmental layer

At departmental layer, a total number of responses are 143 from 18 HEIs. The mean of all HEIs of first question item is 3.87 and question two is reported as 3.86 producing the usage mean of 3.865. The ERPS usage of all HEIs is showing agreement by the users of ERPS system. In a comparison of ERPS usage at this layer, HE03 has shown highest mean value 4.50 presenting the maximum usage of ERPS while the minimum is observed in HE02. The usage in six higher education institutions is above average. The relevant details are shared in Table 5.27.

Table 5.27-Departmental layer ERPS usage

HEI	No of Responses	Mean Q1	Mean Q2	Overall Mean	Percentage relative to overall mean value
ALL	**143**	**3.87**	**3.86**	**3.86**	**100**
HE01	33	4.00	4.12	4.06	105
HE02	2	3.00	2.50	2.75	71
HE03	10	4.30	4.70	4.50	116
HE04	2	3.50	3.00	3.25	84
HE05	5	4.20	4.40	4.30	111
HE06	2	3.50	4.00	3.75	97
HE07	3	4.00	3.00	3.50	91
HE08	3	4.00	3.67	3.83	99
HE09	3	2.67	3.00	2.83	73
HE10	9	3.56	3.78	3.67	95
HE11	12	3.25	3.08	3.17	82
HE12	7	3.86	3.71	3.79	98
HE13	8	3.75	3.38	3.56	92
HE14	6	3.33	3.17	3.25	84
HE15	3	2.67	3.00	2.83	73
HE16	15	4.33	4.27	4.30	111
HE17	13	4.31	4.00	4.15	108
HE18	7	4.00	4.43	4.21	109

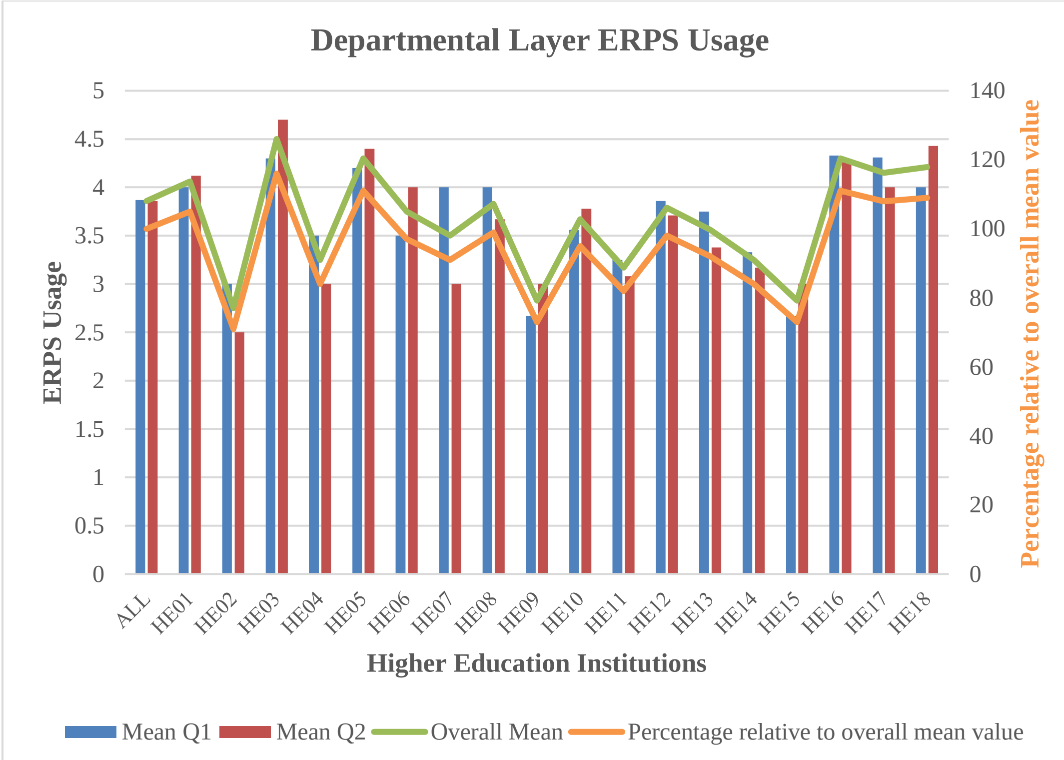

Figure 5.9-Departmental layer ERPS usage

5.5.3 End-user layer

The final layer is representing the end-users of ERPS. At this layer, a total number of responses are 1088 from 18 HEIs. The mean of ERPS usage of all HEIs is 3.50. The value is presenting lower usage than the top two layers. While comparing the ERPS usage at the end-user layer, HE05 is having a highest mean value of 3.94 while the minimum is observed in HE02 with value 2.55 indicating that overall end-users are less satisfied with the ERPS usage. While considering the percentage comparison with the usage of ERPS in all HEIs, exactly 50 percent of higher education institutions are showing ERPS usage above the overall mean value of 3.50. Table 5.28 and Figure 5.10 present the details.

Table 5.28-End-user layer ERPS usage

HEI	No of Responses	Mean Q1	Mean Q2	Overall Mean	Percentage relative to overall mean value
ALL	**1088**	**3.50**	**3.50**	**3.50**	**100**
HE01	141	3.66	3.46	3.56	102
HE02	19	2.58	2.53	2.55	73
HE03	64	3.73	3.70	3.72	106
HE04	20	2.90	2.90	2.90	83
HE05	70	3.87	4.01	3.94	113
HE06	88	3.38	3.30	3.34	95
HE07	53	2.92	3.06	2.99	86
HE08	57	3.70	3.82	3.76	108
HE09	53	3.51	3.57	3.54	101
HE10	151	3.66	3.73	3.69	106
HE11	130	3.58	3.72	3.65	104
HE12	23	3.48	3.52	3.50	100
HE13	41	3.12	3.10	3.11	89
HE14	17	3.00	2.76	2.88	82
HE15	9	3.33	3.44	3.39	97
HE16	34	2.91	3.12	3.01	86
HE17	103	3.61	3.41	3.51	100
HE18	15	3.00	2.93	2.97	85

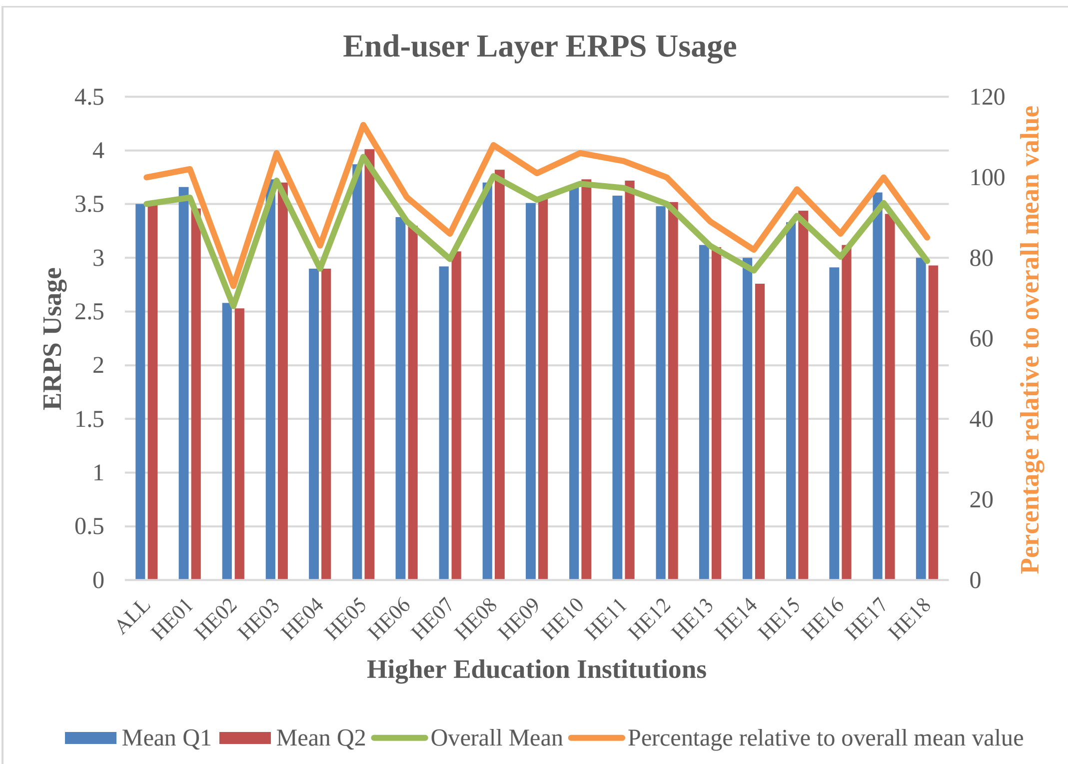

Figure 5.10-End-user layer ERPS usage

The objective of the study also includes the exploration regarding ERPS usage in HEIs. This section has thrown light on an important aspect of the study regarding ERPS usage in Pakistani HEIs including overall ERPS usage and also ERPS usage at the organisational, departmental and end-user layers. Out of all HEIs visited, respondents of HE05 have shown the best level of overall ERPS usage along with best at the organisational layer and end-user layers. This is an important observation in the context of the study. Similarly, HE04 is observed to be at lowest in overall ERPS usage. It is pertinent to mention that both HEIs are from public sector and from the province of Punjab.

5.6 Summary

This chapter discussed the findings of the data collected from all three layers. In total, 2177 questionnaires are distributed by personally visiting eighteen higher education institutions of nine cities of Pakistan. These HEIs are the ERPS users in areas selected for this study. The areas affected by terrorism in Pakistan are not included. Out of 2177, 1317 responses are collected. At organisational layer, 124 questionnaires are distributed and 86 are received back making a response rate of 69 percent. The respondents at this layer are top management employees involved in decision making for ERPS usage. At departmental layer, the respondents are departmental heads and all are teachers. Total 209 questionnaires are distributed and 144 received showing a response rate of 69 percent. The last layer consisted of end-users of ERPS. Out of 1844 distributed questionnaire, 1121 are received making response rate of 61 percent at the end-user layer.

After the data is cleaned, the reliability of the factors of all three layers is examined. The majority of the factors have shown high reliability. Moreover, descriptive statistics of demographics are explained in detail, for instance, amongst the respondents, males were dominant. The age at top two layers is higher than end-user layer as most of the top management officials and heads of departments are also experienced and highly qualified.

At the organisational layer, respondents have agreed to some extent to the usage of ERPS which has the highest mean value among all variables; while lowest is of organisational alignment. At the departmental layer, the majority of the respondents have agreed up to some level of agreement to the existence of operational support with highest mean value while performance-based reward policies have shown the lowest. The highest deviation from mean is observed in ERPS usage. At the end-user layer, participation and support are observed as below the level of the agreement while training is reported as neutral. However, learning orientation and resistance have proved their presence.

ANOVA is run at the collected data to identify the differences in demographics. The results have revealed meaningful results in the context of the research. The respondents of the public sector HEI and private sector HEI have showed difference in their opinions that indicates the difference in management styles and culture of both sectors. It is also interesting to know that different levels of education have influenced that opinions of the respondents. Similarly, the experience has also effected the responses of the ERPS policy makers and users. It is observed that application of this test has produced meaningful results in understanding the ERPS usage in HEIs in Pakistan.

At the organisational layer, results have shown significant differences among categories in certain demographic factors. Public and private sector HEIs have shown significant variations at the organisational layer. Highest education achieved is showing differences in opinion of respondents. Total experience of respondents has shown significant impact of education regarding human resource availability and decision making and control. Furthermore, Experience in HEIs and experience in current HEI have also shown impact on training while experience using ERPS has a difference of respondents’ opinion regarding usage of ERPS at the organisational layer. The demographic difference on the departmental layer are presenting more demographic differences in categories than the organisational layer. Participation and support, managerial patience and usage of ERPS at departmental layer have shown differences in all demographic categories except gender and category as a category on this layer are having only teachers as respondents. The end-user layer also has produced significant differences regarding the opinion of respondents across different categories. The differences between employees and teachers are observed in training, learning orientation and, user satisfaction and usefulness. Gender has expressed difference only in ease of use.

Correlations are also calculated for the three layers. At the organisational layer, all the factors are observed to be correlated moderately with each other. The highest correlation is observed between tolerance for risks and conflicts, and decision making and control, while lowest correlation is between training and decision making and control. Decision making and control has shown strong correlation with collegial support and collaboration, and tolerance for risks and conflicts while all other factors are moderately correlated. At the departmental layer, the strongest correlation is observed between managerial patience and power sharing while weakest correlation is between active advocacy and management participation in ERPS learning sessions. At the end-user layer, most of the correlations among factors are observed as weak. The highest correlation is observed between ease of use and usefulness and user satisfaction, while lowest correlation is between training and resistance evidently relating to literature. Similarly, resistance has shown low correlation with participation and support.

Regression is also carried out for all layers. At organisational layer, regression analysis has presented seven models. Each model has a different number of predictors with varying values of r-square and adjusted r-square. The selected model has seven predictors and explaining 56 percent of the variation in the usage of ERPS for the organisational layer. At the departmental layer, regression analysis has presented seven models. The selected model has seven predictors and explaining 48 percent of the variation in the usage of ERPS for the departmental layer. At the end-user layer; regression analysis has presented seven models. The selected model has seven predictors and explaining 47 percent of the variation in the usage of ERPS for the organisational layer.

Finally, the comparison between HEIs individually is discussed based on the mean values of the question items used to measure ERPS usage at organisational, departmental and end-user layers. These results reveal dissimilar results. In view of top management, HE02 is holding highest usage of ERPS while ERPS usage at departmental and end-user layers is the lowest. However, HE05 evidenced to be steady in ERPS usage at all layers having maximum usage at organisational and end-user layers and also exhibited to be the second best at the departmental layer. The next chapter discusses SEM techniques applied to at three layers.

Chapter 6. Structural Equation Modelling

6.1 Introduction

This chapter presents application of SEM techniques. As the first step in using SEM, structural equations are used to formulate the models for the organisational, the departmental and the end-user layers. Moreover, to obtain results, structural equation modelling techniques are applied to the datasets of three layers. Significant findings of the study are then analysed in the context of the conceptual framework and are used to test the researcher hypotheses devised for the organisational, the departmental and the end-user layers.

6.2 Model formulation and SEM results

The components of structural equations include γ, λ and ζ (Fox, 2002), where γ represents regression coefficient and connects the dependent variable to the independent variables. Symbol λ represents factor loadings of respective question items. The error terms are presented by ζ symbol.

6.2.1 Organisational layer

For the organisational layer, the set of equations is given in Equations 6.1. The first equation presents the structural piece, whereas the next eight equations indicate the measurement part of the SEM. Eq-1 explains variation in usage of ERPS at the organisational layer (Y_O) as a function of seven latent variables. The next set of equations show how each of the seven constructs (O_1 to O_7) has been measured as follows.

- O_1 - human resource availability
- O_2 - tolerance for risks and conflicts
- O_3 - collegial support and collaboration
- O_4 - decision making and control
- O_5 - organisational alignment
- O_6 - training
- O_7 - benefit realisation

Moreover, γ_1 to γ_7 are the regression coefficients of factors O_1 to O_7 respectively, while λ's present the factor loadings of the respective question items. ζ1 and ξOi are the structural disturbance or errors in Equations 6.1.

$$Y_O = \gamma_0 + \gamma_1 O_1 + \gamma_2 O_2 + \gamma_3 O_3 + \gamma_4 O_4 + \gamma_5 O_5 + \gamma_6 O_6 + \gamma_7 O_7 + \zeta_1$$

$$O_1 = \lambda_{11}O_{11} + \lambda_{12}O_{12} + \lambda_{13}O_{13} + \lambda_{14}O_{14} + \lambda_{15}O_{15} + \lambda_{16}O_{16} + \xi O_1$$
$$O_2 = \lambda_{21}O_{21} + \lambda_{22}O_{22} + \lambda_{23}O_{23} + \lambda_{24}O_{24} + \lambda_{25}O_{25} + \lambda_{26}O_{26} + \xi O_2$$
$$O_3 = \lambda_{31}O_{31} + \lambda_{32}O_{32} + \lambda_{33}O_{33} + \lambda_{34}O_{34} + \xi O_3$$
$$O_4 = \lambda_{41}O_{41} + \lambda_{42}O_{42} + \lambda_{43}O_{43} + \lambda_{44}O_{44} + \lambda_{45}O_{45} + \lambda_{46}O_{46} + \lambda_{47}O_{47} + \lambda_{48}O_{48} + \xi O_4$$
$$O_5 = \lambda_{51}O_{51} + \lambda_{52}O_{52} + \lambda_{53}O_{53} + \xi O_5$$
$$O_6 = \lambda_{61}O_{61} + \lambda_{62}O_{62} + \lambda_{63}O_{63} + \lambda_{64}O_{64} + \lambda_{65}O_{65} + \lambda_{66}O_{66} + \xi O_6$$
$$O_7 = \lambda_{71}O_{71} + \lambda_{72}O_{72} + \lambda_{73}O_{73} + \lambda_{74}O_{74} + \lambda_{75}O_{75} + \lambda_{76}O_{76} + \zeta O_7$$

Equations 6.1-Organisational layer SEM model formulation

The distributional assumptions about the error terms are normality, linearity, homoscedasticity and independence of the error terms. Normality refers to the assumption that variables have normal distributions (Osborne and Waters, 2002). This is tested using histograms, skewness and normal probability plots and found to be normally distribution. Linearity is explained as the independent and the dependent variables must have a linear relationship (Osborne and Waters, 2002). Linearity is tested through scatter plot of the standardised predicted value and standardised residual. Homoscedasticity means that for all the independent variables, the variance of errors is the same (Osborne and Waters, 2002). This is checked using the scatter plot of standardised residuals and the predicted values.

Further, the independence of the error terms is tested using Durbin-Watson test and is explained as that there is no correlation among the residuals. The data used for the analysis satisfies all the assumptions at the organisational, the departmental and the end-user layers. The assumptions explained in this section are also implied for Equations 6.2 and Equations 6.3.

As the next step, the structural equations formulated for the usage of ERPS at the organisational layer given above are presented visually in Figure 6.1. The ellipses represent the factors and the dependent variable. O_1 to O_7 inside factors ellipses are explaining the variance of the relevant factors while γO_1 to γO_7 are the regression coefficients of factors contributing to the usage of ERPS at this layer. The λ's are the representatives of the factor loadings of question items respective to their factors as shown in Figure 6.1.

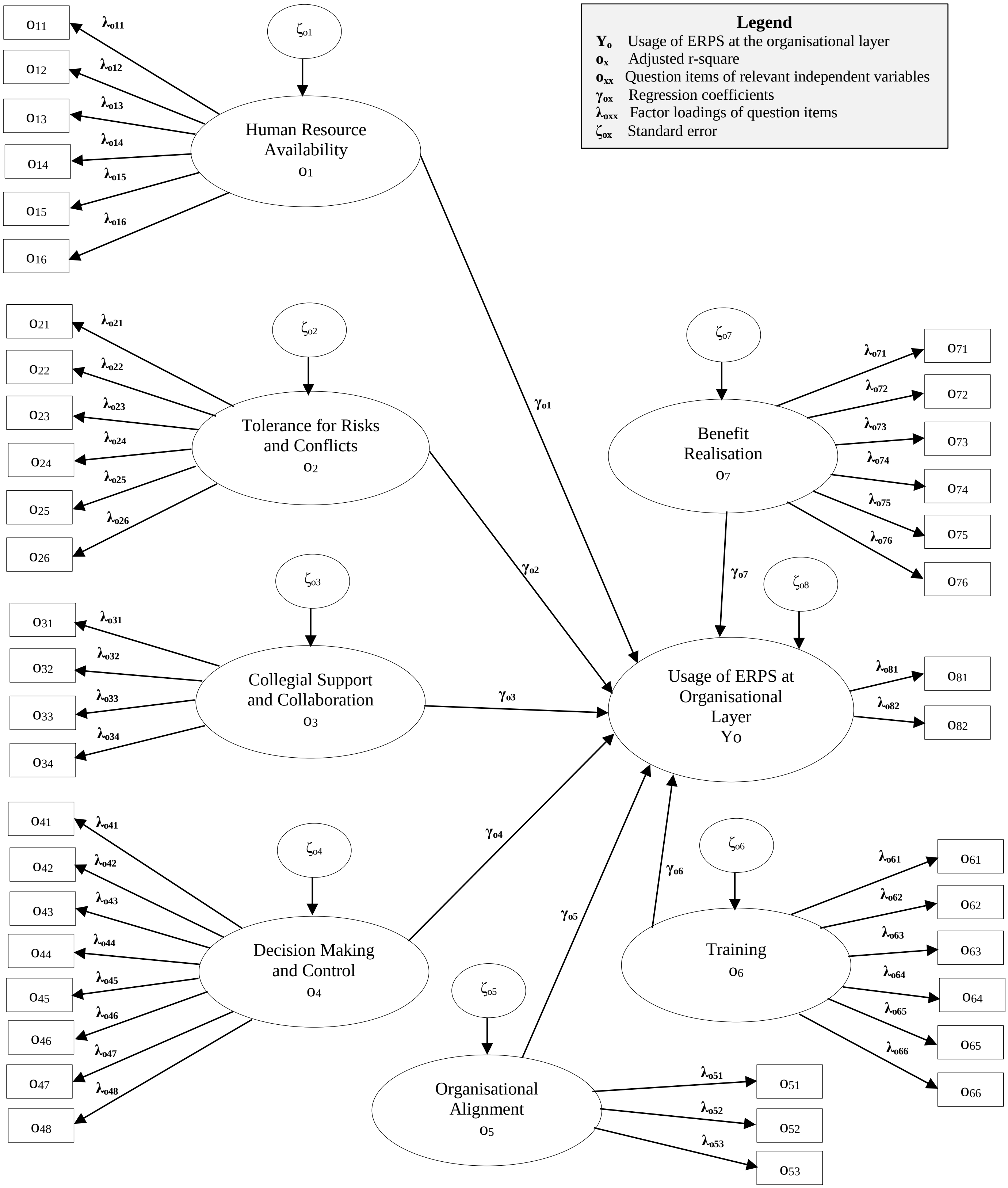

Figure 6.1-Organisational layer SEM diagram

The sample size at the organisational is lower than the guidelines suggested in the literature. This is the limitation of the study for the organisational layer as the population at this layer is very small. In this study, formula provided by Tabachnick and Fidell (2001) is used for calculating sample size requirements. The formula takes into consideration the number of independent variables to be used. The number of independent variables for the organisational layer are eight while the formula $N > 50 + 8m$ (where m = number of independent variables) suggests that four independent variables may be used as the sample size at the organisational layer is 86. Due to this limitation at the organisational layer, three independent variables are dropped one by one based on lowest adjusted r-square. Three variables are dropped from the model one by one based on the lowest adjusted r-squares namely benefit realisation, training and organisational alignment. The adjusted r-squares of the variables retained are presented in Table 6.1.

Table 6.1-Organisational layer retained independent variables

Factors	Adjusted R-square
Human Resource Availability	0.88
Tolerance for Risks and Conflicts	0.96
Collegial Support and Collaboration	0.91
Decision Making and Control	0.85

SEM produces model fit indicators like CFI, RMSEA and SRMR. The guidelines of a good model fit explain that CFI should be closer to one, RMSEA should be close to 0.06 or a stringent upper limit of 0.07 (Steiger, 2007) seems to be the general consensus amongst authorities in this area and SRMR value should be less than .05 (Diamantopoulos et al., 2000), however values as high as 0.08 are deemed acceptable (Hu and Bentler, 1999b).

SEM is run on the model and the results reveal that CFI value is observed as 0.63 while RMSEA is reported as 0.12 and SRMR is 0.11. These indicators of model fit produced by SEM have presented a weak model fit. This is mainly due to small data set. This layer has the limitation of not having large data set as the population is not large.

The process on failing to find a good model fit is the application of SEM extensions as these are applied in Chapter 7. The process of the application of SEM extensions includes finding the inter-item correlations and inter-factor correlations based on the high values of modification indices.

Regarding the usage of ERPS at the organisational layer, the results have shown that all the proposed factors have significant and higher effects on the usage of ERPS. Table 6.2 overleaf presents the regression coefficients of the model explaining that decision making and control 0.97 has the highest effect on the usage of ERPS at this layer while human resource availability has the lowest with 0.88. Therefore, all the hypothesised factors included in the model are accepted and are used for the application of SEM extensions in Chapter 7. Moreover, the highest value of standard error is observed in human resource availability 0.23 while lowest is of decision making and control 0.06. Furthermore, adjusted r-square of the model at an organisational layer is reported 0.56 representing total 56 percent contribution of the above-presented factors towards ERPS usage. The regression coefficients values and adjusted r-squares are given in Table 6.2.

Table 6.2-Organisational layer SEM results

Factors	Coefficients	Adjusted R-square
Human Resource Availability	0.88**	0.77
Tolerance for Risks and Conflicts	0.96**	0.92
Collegial Support and Collaboration	0.96**	0.92
Decision Making and Control	0.97**	0.94

*** p < 0.01*

SEM diagram employs the usual conventions. The factors loadings are displayed on a single headed arrow for each question item against its respective factor. The directed arrows connecting dependent and independent variables are labelled with the corresponding regression coefficients. The SEM diagram of the organisational layer is shown in Figure 6.2 along with factor loadings of question items of each independent variable, regression coefficients and adjusted r-squared values.

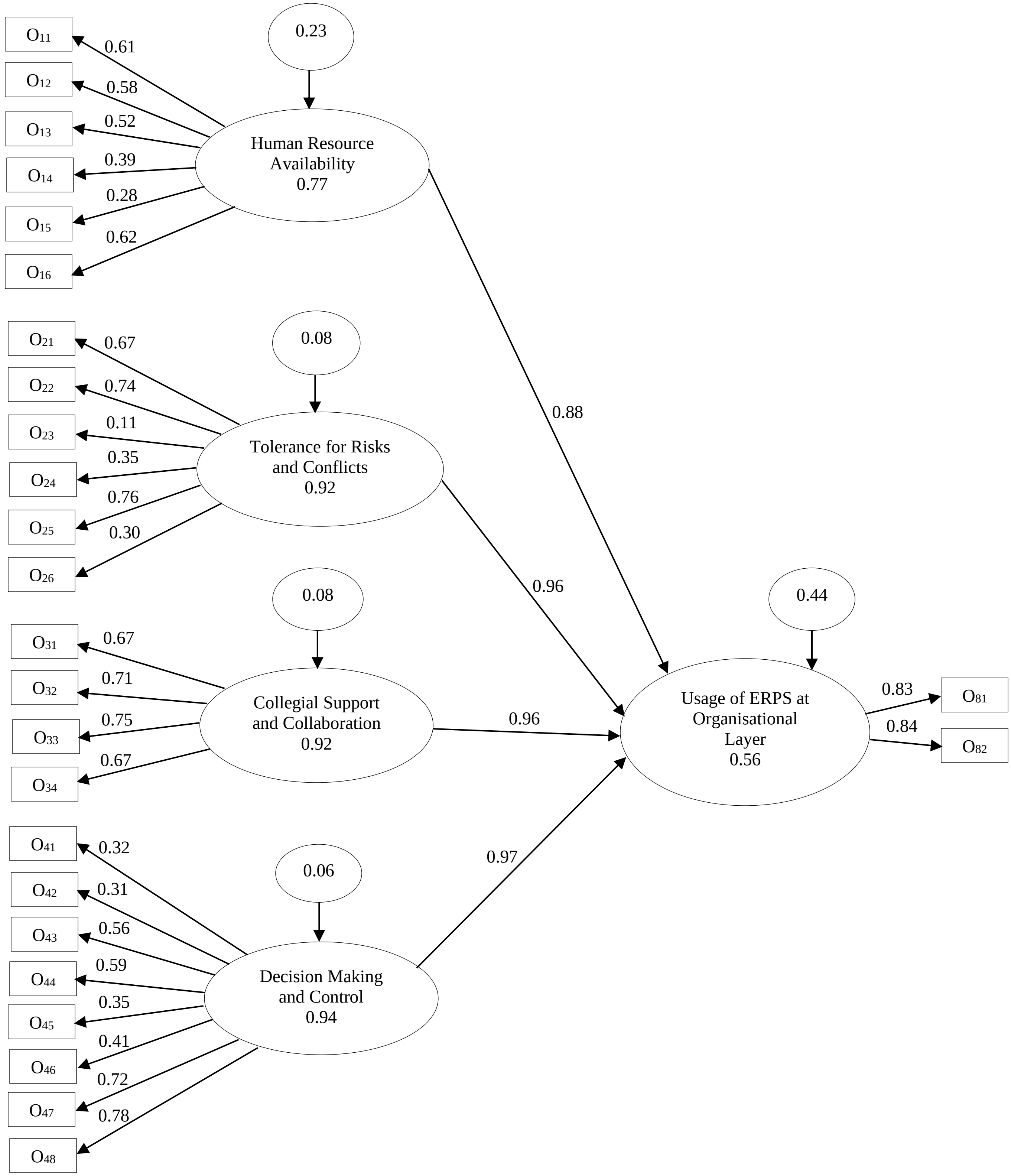

Figure 6.2-Organisational layer SEM results

6.2.2 Departmental layer

For the departmental layer, the following structural equations are formulated in Equations 6.2. The first equation explains variation in the usage of ERPS at the departmental layer (Y_d). The next set of equations show how each of the seven constructs, d_1 to d_7, has been measured representing the relevant factors as follows.

- d_1 - operational support
- d_2 - managerial patience
- d_3 - active advocacy
- d_4 - management participation in ERPS learning sessions
- d_5 - managerial citizenship behaviour
- d_6 - power sharing
- d_7 - performance based reward policy

Last equation explains the factors that are used to measure the usage of ERPS at the departmental layer. γ_1 to γ_7 are the regression coefficients of factors d_1 to d_7 respectively, while λ's present the factor loadings of the respective question items. ζ_2 and ξd_i are the structural disturbance or errors in Equations 6.2.

$$Y_d = \gamma_0 + \gamma_1 d_1 + \gamma_2 d_2 + \gamma_3 d_3 + \gamma_4 d_4 + \gamma_5 d_5 + \gamma_6 d_6 + \gamma_7 d_7 + \zeta_2$$

$$d_1 = \lambda_{11}d_{11} + \lambda_{12}d_{12} + \lambda_{13}d_{13} + \lambda_{14}d_{14} + \xi d_1$$
$$d_2 = \lambda_{21}d_{21} + \lambda_{22}d_{22} + \lambda_{23}d_{23} + \lambda_{24}d_{24} + \lambda_{25}d_{25} + \xi d_2$$
$$d_3 = \lambda_{31}d_{31} + \lambda_{32}d_{32} + \lambda_{33}d_{33} + \lambda_{34}d_{34} + \xi d_3$$
$$d_4 = \lambda_{41}d_{41} + \lambda_{42}d_{42} + \lambda_{43}d_{43} + \lambda_{44}d_{44} + \xi d_4$$
$$d_5 = \lambda_{51}d_{51} + \lambda_{52}d_{52} + \lambda_{53}d_{53} + \lambda_{54}d_{54} + \lambda_{55}d_{55} + \lambda_{56}d_{56} + \xi d_5$$
$$d_6 = \lambda_{61}d_{61} + \lambda_{62}d_{62} + \lambda_{63}d_{63} + \lambda_{64}d_{64} + \lambda_{65}d_{65} + \xi d_6$$
$$d_7 = \lambda_{71}d_{71} + \lambda_{72}d_{72} + \lambda_{73}d_{73} + \lambda_{74}d_{74} + \lambda_{75}d_{75} + \xi d_7$$

Equations 6.2-Departmental layer SEM model formulation

As the second step, the structural equations formulated for the usage of ERPS at the departmental layer given above are presented visually in Figure 6.3.

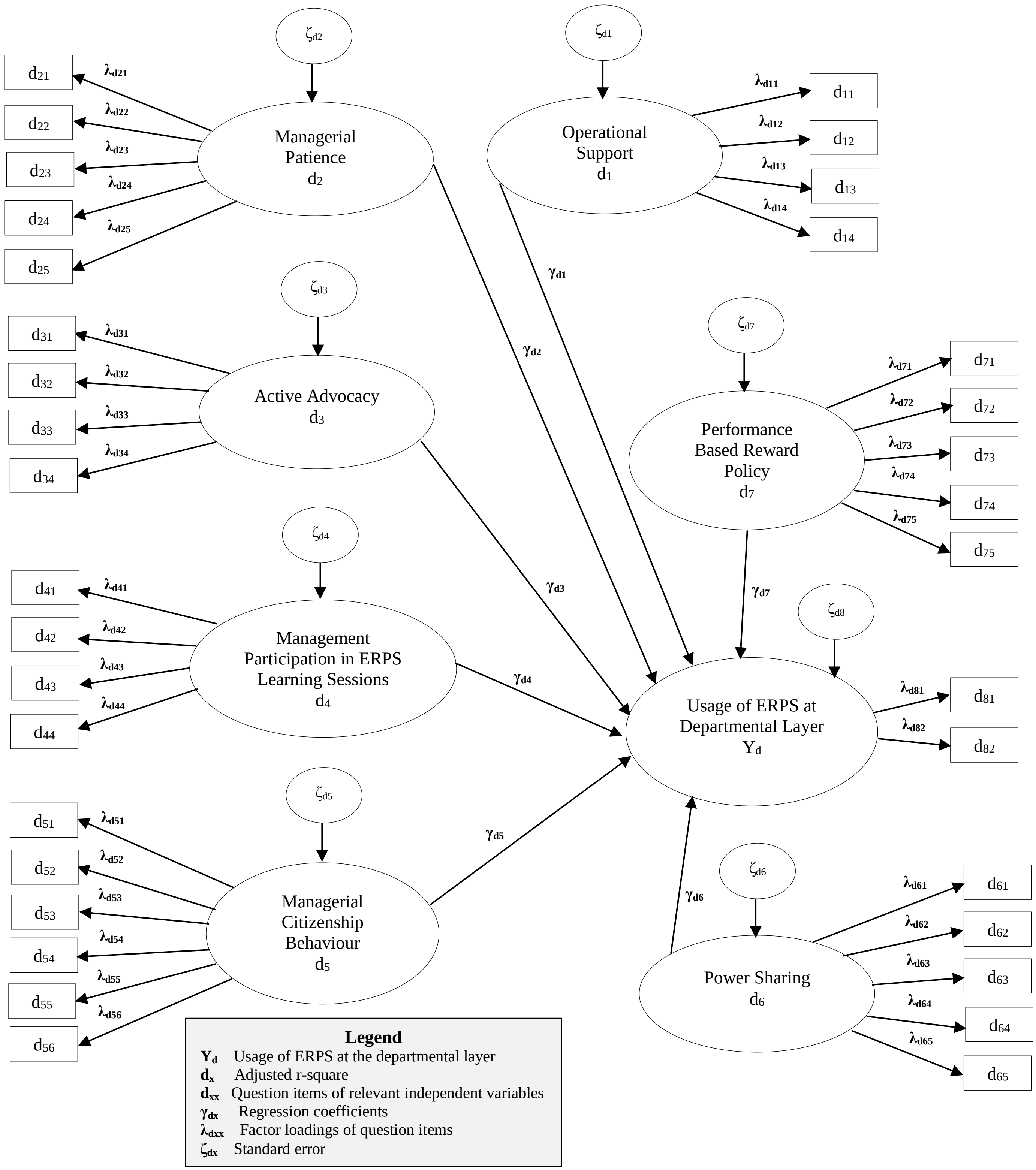

Figure 6.3-Departmental layer SEM diagram

At departmental layer, CFI value is 0.80, RMSEA is 0.09, and SRMR is 0.07. These indicators of model fit produced by SEM presented a good model fit. The dataset on this layer is also not considered as large dataset having 143 clean responses. Regarding the usage of ERPS at the departmental layer, the results have shown that all the proposed factors have significant, yet varying, effects on the usage of ERPS. Performance based reward policy has the highest effect of 0.93 while managerial participation in ERPS learning sessions has the least effect on value of 0.61 on the usage of ERPS at the departmental layer. Therefore, all the hypothesised factors included in the model are accepted. With regards to the coefficients of determination for SEM (Schreiber et al., 2006), the lowest value is 0.61 for management participation in ERPS learning session which is in an acceptable range. The highest value is 0.93 for performance based reward policy explaining 93 percent of the variation by five question items of the specified factor. Thus, all the hypotheses proposed for the end-user layer are supported. The adjusted r-square of the model is 0.63, hence the factors included in the model explains 63 percent variation towards the ERPS usage at the departmental layer. The regression coefficients values are given in Table 6.2.

Table 6.2-Departmental layer SEM results

Factors	Coefficients	Adjusted R-square
Operational Support	0.81**	0.65
Managerial Patience	0.88**	0.78
Active Advocacy	0.79**	0.63
Management Participation in Learning Sessions	0.61**	0.37
Managerial Citizenship Behaviour	0.81**	0.66
Power Sharing	0.82**	0.67
Performance Based Reward Policy	0.93**	0.86

*** $p < 0.01$*

The same is presented in detail in Figure 6.4 graphically.

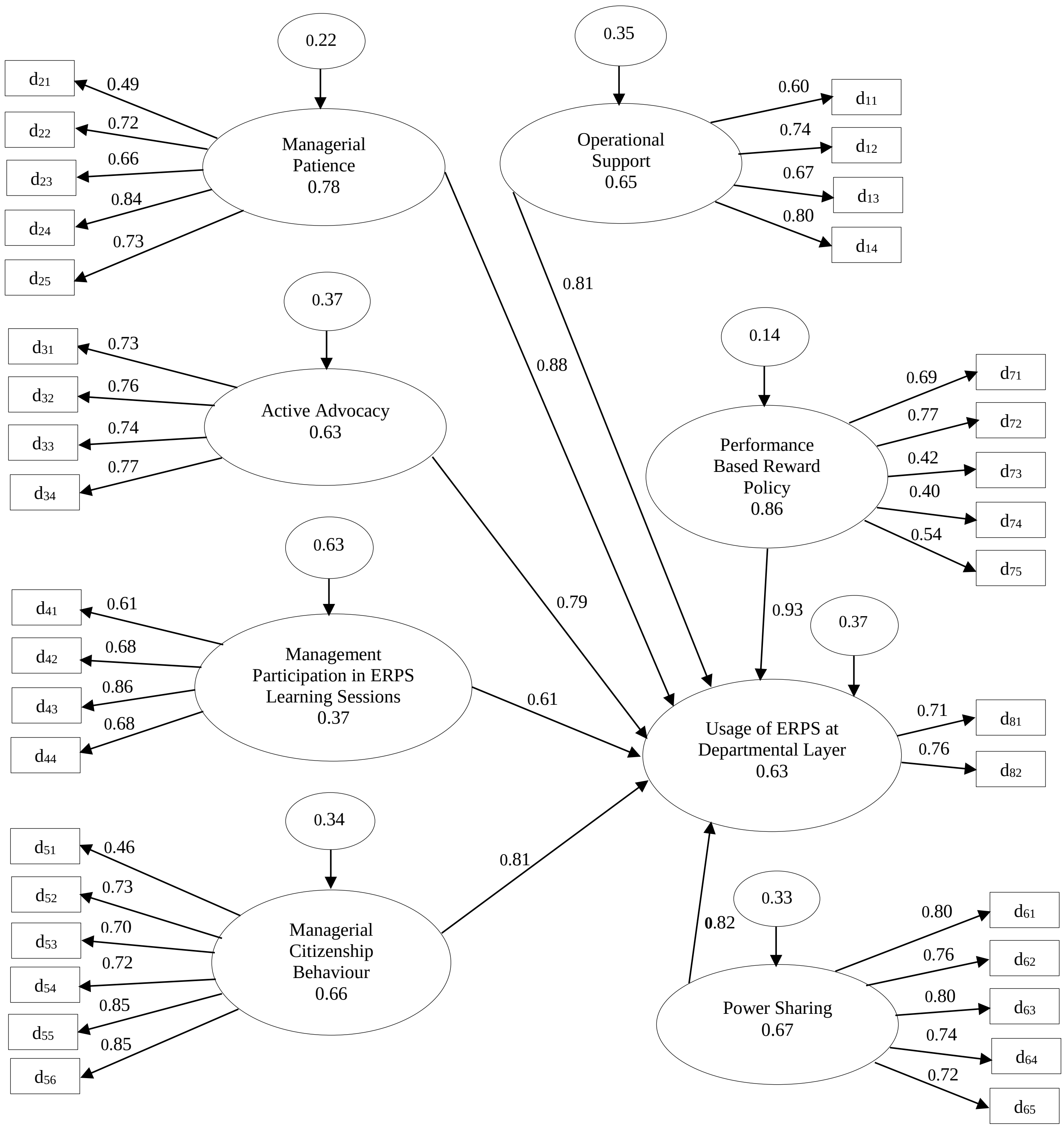

Figure 6.4-Departmental layer SEM results

6.2.3 End-user layer

For the end-user layer, the following structural equations are formulated as presented in Equations 6.3. The first equation explains variation in usage of ERPS at the end-user layer (Y_e). The next set of equations show how each of the seven constructs, e_1 to e_7, has been measured.

- e1 - training
- e2 - learning orientation
- e3 - acceptance and usage of system
- e4 - stands for participation and support
- e5 - resistance
- e6 - ease of use
- e7 - usefulness and user satisfaction

Furthermore, γ_1 to γ_7 are the regression coefficients of factors e_1 to e_7 respectively, while λ's present the factor loadings of the respective question items. ζ_3 and ξe_i are the structural disturbance or errors in Equations 6.3.

$$Y_e = \gamma_0 + \gamma_1 e_1 + \gamma_2 e_2 + \gamma_3 e_3 + \gamma_4 e_4 + \gamma_5 e_5 + \gamma_6 e_6 + \gamma_7 e_7 + \zeta_3$$

$$\begin{aligned}
e_1 &= \lambda_{11}e_{11} + \lambda_{12}e_{12} + \lambda_{13}e_{13} + \lambda_{14}e_{14} + \lambda_{15}e_{15} + \lambda_{16}e_{16} + \lambda_{17}e_{17} + \xi e_1 \\
e_2 &= \lambda_{21}e_{21} + \lambda_{22}e_{22} + \lambda_{23}e_{23} + \xi e_2 \\
e_3 &= \lambda_{31}e_{31} + \lambda_{32}e_{32} + \lambda_{33}e_{33} + \xi e_3 \\
e_4 &= \lambda_{41}e_{41} + \lambda_{42}e_{42} + \xi e_4 \\
e_5 &= \lambda_{51}e_{51} + \lambda_{52}e_{52} + \lambda_{53}e_{53} + \xi e_5 \\
e_6 &= \lambda_{61}e_{61} + \lambda_{62}e_{62} + \lambda_{63}e_{63} + \xi e_6 \\
e_7 &= \lambda_{71}e_{71} + \lambda_{72}e_{72} + \lambda_{73}e_{73} + \lambda_{74}e_{74} + \xi e_7
\end{aligned}$$

Equations 6.3-End-user layer SEM model formulation

The above equations for factors affecting the usage of ERPS at the end-user layer are presented visually in Figure 6.5.

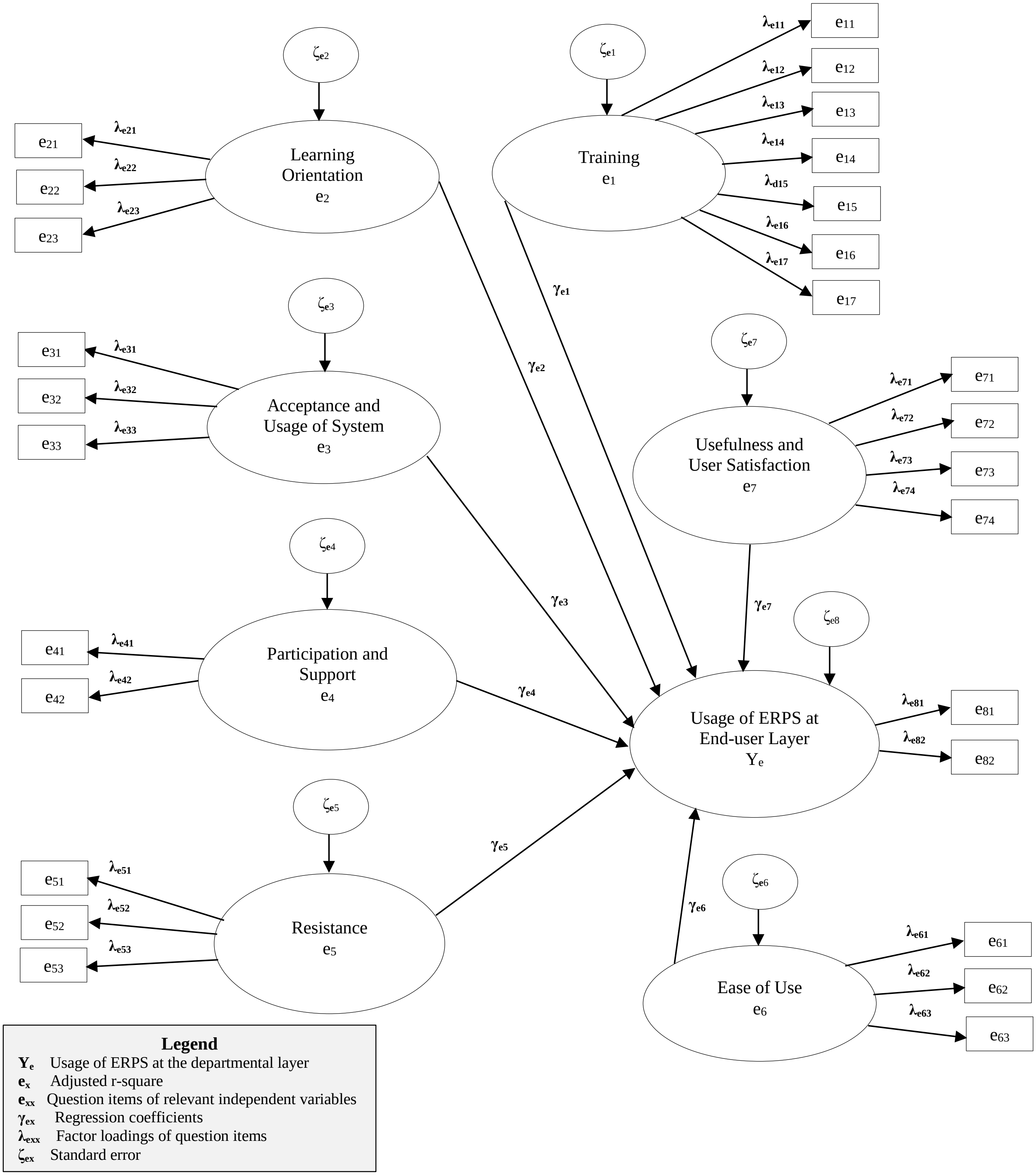

Figure 6.5-End-user layer SEM diagram

At this layer, all independent variables contribute to latent variable, usage of ERPS at the end-user layer. These indicators of model fit, CFI value is 0.882, RMSEA is 0.08, SRMR is 0.08, produced by SEM presented a reasonable model fit. SEM results of the end-user layer have shown that all the proposed factors have significant effects on the usage of ERPS at that layer. The highest effect is from usefulness and user satisfaction with 0.92 while lowest is training 0.39. With regards to the coefficients of determination for SEM (Schreiber et al., 2006), the highest value is 0.92 for usefulness and user satisfaction explaining 92 percent of the variation by four question items of the specified factor. Thus, all the hypotheses proposed for the end-user layer are supported. The adjusted r-square of the model at an end-user layer is 0.50 depicting that the factors included in the model are predicting 50 percent of the ERPS usage at the end-user layer. The details are presented in Table 6.3.

Table 6.3-End-user layer SEM results

Factors	Coefficients	Adjusted R-square
Training	0.39**	0.15
Learning Orientation	0.58**	0.34
Acceptance and Usage of System	0.80**	0.64
Participation and Support	0.46**	0.21
Resistance	0.62**	0.38
Ease of Use	0.75**	0.57
Usefulness and User Satisfaction	0.92**	0.85

*** $p < 0.01$*

Moreover, SEM diagram with results for factors affecting usage of ERPS at the end-user layer is presented in Figure 6.6.

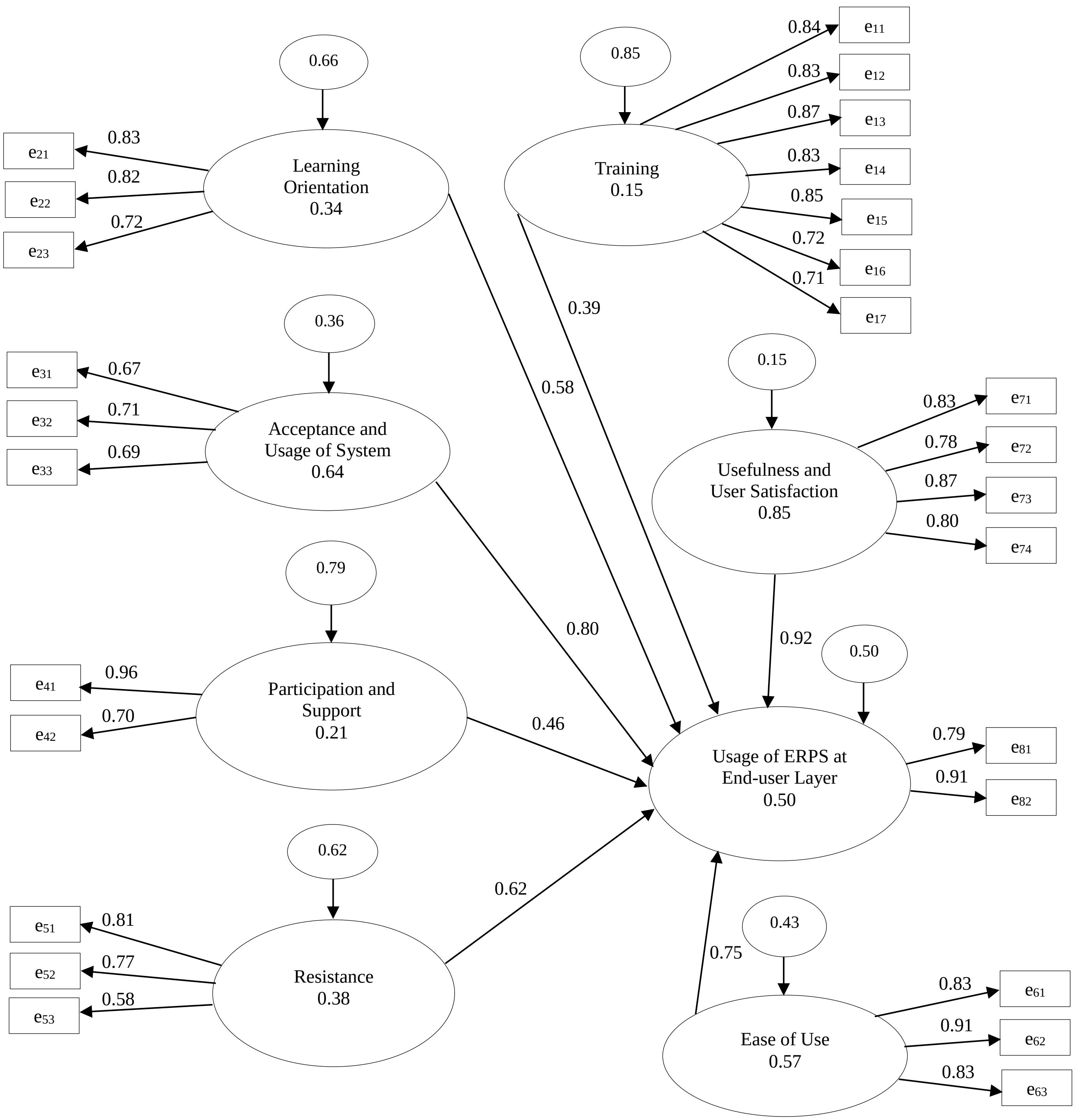

Figure 6.6-End-user layer SEM results

6.2.4 All layers

Table 6.4 consolidates model fit indicators of all three layers. Organisational layer results show weak model fit as the dataset is small for this layer while departmental layer and end-user layers produce a good model fit.

Table 6.4-All layers model fit

Layers	RMSEA	CFI	TLI	GFI	SRMR	Adjusted r-square
Organisational	0.12***	0.63	0.59	0.64	0.11	0.56
Departmental	0.09***	0.80	0.79	0.71	0.07	0.63
End-user	0.08***	0.81	0.88	0.87	0.08	0.50

****p<0.000*

Thus, the use of SEM has helped to identify the relevant factors affecting the usage of ERPS at all three layers and has shown that the majority of the factors contributed a significantly large proportion of the variance to measure their relevant concepts.

6.3 Summary

This chapter presented the application of SEM techniques. Firstly, structural equations are formulated to apply SEM techniques. Secondly, SEM is applied on the data of each layer. The SEM model fit results of organisational layer exhibit a weak model fit due to small data set while strong coefficients values are reported as highly significant. The results show that all the proposed factors have significant, yet varying, effects on the usage of ERPS. Therefore, all the hypothesised factors included in the model are accepted. Moreover, adjusted r-square of the model at the organisational layer is reported as 0.56. At the departmental layer, the indicators of model fit produced by SEM has presented a good model fit. Regarding the usage of ERPS at the departmental layer, the results show that all the proposed factors have significant effects on the usage of ERPS. Therefore, all the hypothesised factors included in the model are accepted at this layer. Furthermore, the adjusted r-square of the model is reported 0.63. SEM results of end-user layer show that all the proposed factors have significant effects on the usage of ERPS at that layer. Similar to the middle layer, all the hypotheses proposed for the end-user layer are supported. The adjusted r-square of proposed model at an end-user layer is 0.50 depicting that the factors included in the model are predicting 50 percent of the ERPS usage at the end-user layer. The objective of the study is to identify the factors affecting usage of ERPS at organisational, departmental and end-user layers in Pakistani HEIs. SEM results show that all the factors included in the model are proved to be significant contributors to ERPS usage in HEIs in Pakistan. The next chapter discusses SEM extension techniques applied to refine the models at three layers.

Chapter 7. SEM Extensions

7.1 Introduction

This chapter discusses the SEM extensions that are being used in the study for model refinement. Inter-item correlations and inter-factor correlations are explored based on values of modification indices. The process is used to improve model fit indicators to find the best model fit. The application of SEM extensions is discussed in next section.

7.2 Model improvement

SEM extensions are applied to all three layers to find inter-item correlations among the same factor and inter-factor correlations of the overall model. The observed correlations are incorporated in the model to get the best model fit values. The process is done step by step as discussed below.

7.2.1 Organisational layer

Organisational layer base model developed in Chapter 6 is used as starting point to improve the model. The base model, here, is called Model 1. This model 1 is executed to generate the model fit indicators. CFI value is observed as 0.632 while RMSEA is reported 0.121 and SRMR are 0.106. These indicators of model fit produced by SEM are presenting a weak model fit due to the small data set. This layer has the limitation of not having large data set as the population is not large.

To improve this model, SEM extensions are employed. As the first step inter-item correlations are observed based on modification indices (Morgado et al., 2017, Perry, 1996, Schaufeli et al., 2002, Segars and Grover, 1993). The items that are found to have a correlation among them based on Modification Indices (MI) greater than ten are from factors O1-Human Resource Availability (HR) and O4-Decision Making and Control (DM). As given in the Table 7.1, HR-O1_4 poised in the second column is having a correlation with HR-O1_5 placed in the third column. It indicates inter-item correlations between question item number four and question item number five of the factor human resource availability. The details are presented in Table 7.1.

Table 7.1-Organisational layer model 1 inter-item correlations

Factors	Question Items		Modification Indices
Human Resource Availability	HR-O1_4	HR-O1_5	35.49
Decision Making and Control	DM-O4_7	DM-O4_8	11.17

These inter-item correlations are incorporated in SEM model 1 to create model 2. Model 2 is revised model incorporating inter-item correlations based on MI greater than ten of items as mentioned in Table 7.1. The results of model 2 are slightly improved. CFI value is observed as 0.684 while RMSEA is reported 0.113 and SRMR are 0.100 while adjusted r-square has improved to 0.59. These indicators of model fit are improved as compared with model fit indicators of model 1. After the results of model 2 are obtained, inter-factor correlations are checked. The factors do not have any correlation among them. Moreover, inter-item correlations are checked again and it is observed that there are no further inter-item correlations.

To improve the model further, the question items with factor loading less than 0.40 are to be excluded from SEM model (Hair et al., 2011, Yoon and Uysal, 2005). The following items are removed from model 2 to develop a revised model, named as model 3. In model 3, HR-O1_4 and HR-O1_5 are the items removed from human resource availability. Further, three items are removed from Tolerance for Risks and Conflicts (TO); TO-O2_3, TO-O2_4 and TO-2_6. Furthermore, four items are removed from the factor decision making and control; DM-O4_1, DM-O4_2, DM-O4_5 and DM-O4_6. In total nine question items are removed from the revised model due to low factor loadings. The details are presented in Table 7.2.

Table 7.2-Organisational layer model 2 items removal factor loadings<0.40

Factors	Question Items			
Human Resource Availability	HR-O1_4	HR-O1_5		
Tolerance for Risks and Conflicts	TO-O2_3	TR-O2_4	TR-O2_6	
Decision Making and Control	DM-O4_1	DM-O4_2	DM-O4_5	DM-O4_6

The above-mentioned question items are having factor loadings lower than 0.40. These question items are removed from the next model devised as model 3 that is revised model based on model 2. Then the SEM model 3 is run again to produce results. The significant improvement is observed in model fit indicators. CFI value is observed as 0.873, GFI as 0.786 and TLI is 0.847. These indicators have improved in comparison with model 2 results. Moreover, RMSEA is reported 0.083 and SRMR is reported as 0.075.

Further, Model 3 results are showing that one question item is having a factor loading less than 0.50 from a factor of Human Resource Availability, HR-O1_3. Therefore, this one item is also removed from the next model as shown in Table 7.3.

Table 7.3-Organisational layer model 4 items removal factor loadings<0.50

Factor	Question Item
Human Resource Availability	HR-O1_3

The question item as mentioned above is removed from the next model named as model 4. Then the SEM model 4 is run to produce results. The results are observed to be further improved. CFI value is observed as 0.891, GFI as 0.810 and TLI is 0.890. Moreover, RMSEA and SRMR are 0.079 and 0.072 respectively. The results have improved significantly after the application of SEM extensions and are showing a reasonable model fit as these are close to the acceptable guidelines of the model fit indicators. As discussed in Chapter 6, the guidelines of a good model fit explain that CFI, GFI and TLI should be closer to one, RMSEA should be close to 0.06 or a stringent upper limit of 0.07 (Steiger, 2007) seems to be the general consensus amongst authorities in this area and SRMR value should be less than .05 (Diamantopoulos et al., 2000), however values as high as 0.08 are deemed acceptable (Hu and Bentler, 1999b).

Finally, after applying for SEM extensions on this layer, the results show that all question items are now having above 0.50 factor loadings. Moreover, there are no inter-item correlations observed now as they are previously there and also no inter-factor correlations are detected. Regarding the usage of ERPS at the organisational layer based on model 4, the results are showing that there is an overall improvement in the regression coefficients values too. Moreover, all the proposed factors have significant, yet varying effects on the usage of ERPS. With regards to the coefficients of determination for SEM (Schreiber et al., 2006), decision making and control has the highest effect (0.96) while human resource availability has the lowest (0.90) on the usage of ERPS at this layer. The adjusted r-square of the model is reported as 0.69 predicting 69 percent of variation is explained in ERPS usage at organisational layer by the factors that are presented in the model. Therefore, all the hypothesised factors included in model 4 are accepted as a contributor to the usage of ERPS at the organisational layer. In Table 7.4, an overview of the whole process is showing the step by step development of four models. The process is started from model 1 that is the base model and has ended at model 4. RMSEA is reduced to 0.079 from 0.121 and SRMR is reduced from 0.106 to 0.072 while CFI is improved from 0.632 to 0.891. Similarly, TLI is improved from 0.593 to 0.890 and GFI from 0.644 to 0.810. The regression coefficients and adjusted r-squared values have also improved as reported in Table 7.4

Table 7.4-Organisational layer SEM extension results

	RMSEA	**CFI**	**TLI**	**GFI**	**SRMR**	**HR Coeff (Ad-r^2)**	**TO Coeff (Ad-r^2)**	**CS Coeff (Ad-r^2)**	**DM Coeff (Ad-r^2)**	**UO Coeff (Ad-r^2)**
Model 1 Base Model	0.121 (p 0.000)	0.632	0.593	0.644	0.106	0.88*** (0.77)	0.96*** (0.92)	0.96*** (0.92)	0.97*** (0.94)	(0.56)
Model 2 Inter Item Correlations	0.113 (p 0.000)	0.684	0.648	0.664	0.100	0.91*** (0.83)	0.96*** (0.92)	0.94*** (0.89)	0.98*** (0.96)	(0.59)
Model 3 Factor Loadings < 0.50	0.083 (p 0.000)	0.873	0.847	0.786	0.075	0.90*** (0.81)	0.96*** (0.93)	0.94*** (0.89)	0.98*** (0.95)	(0.68)
Model 4 Factor Loadings < 0.50	**0.079 (p 0.000)**	**0.891**	**0.890**	**0.810**	**0.072**	**0.90*** (0.88)**	**0.96*** (0.93)**	**0.94*** (0.91)**	**0.98*** (0.96)**	**(0.69)**

*** *$p < 0.001$*

The final SEM diagram for the organisational layer is presented in Figure 7.1. The factor loadings are displayed on a single headed arrow for each question item against its respective factor. The directed arrows connecting dependent and independent variables are labelled with the corresponding regression coefficients. Inter-item correlations are designated by curve double headed arrows. The final SEM diagram presents inter-item correlations, factor loadings of question items of each independent variable, regression coefficients and adjusted r-squared values.

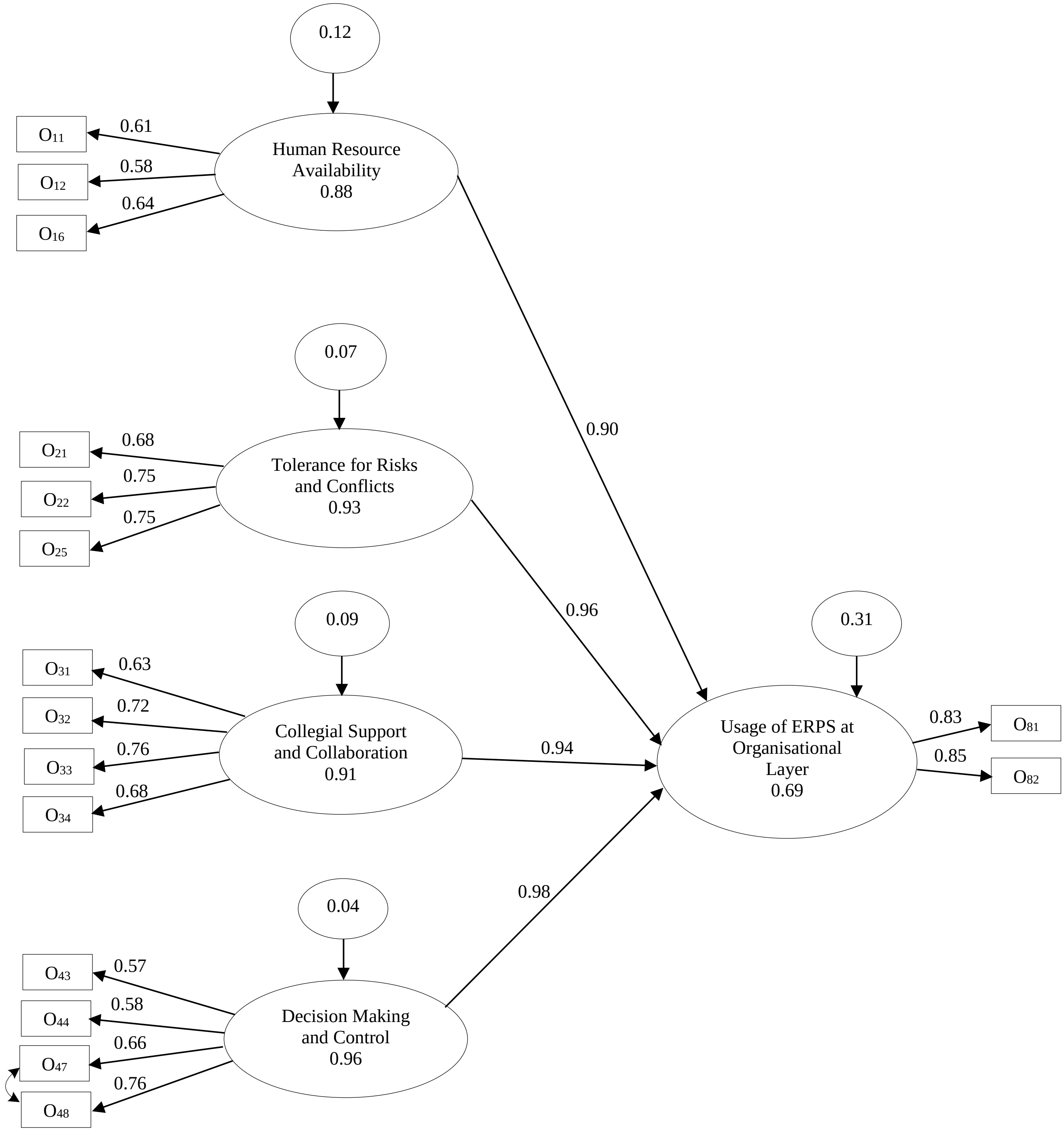

Figure 7.1-Organisational layer SEM extension diagram

7.2.2 Departmental layer

For departmental layer, the base model is taken from Chapter 6 named as Model 1. Model 1 results are, CFI value is 0.80, RMSEA is 0.09, and SRMR is 0.07. These indicators of model fit produced by SEM have presented a good model fit. The dataset on this layer is also not considered as large dataset having 143 responses. However, SEM extensions are applied in following steps to improve the model fit indicators.

To improve model 1, SEM extensions are employed. As the first step inter-item correlations are observed based on modification indices greater than ten. The items that are found to have a correlation among them based on MI greater than ten are from factors D5-Managerial Citizenship Behaviour (MC), D6-Power Sharing (PS) and D7-Performance Based Reward Policy (PB). As given in the following table, MC-D5_1 positioned in the second column is having a correlation with MC-D5_2 placed in the third column. It indicates inter-item correlation between question item one and question item two of the factor D5-Managerial Citizenship Behaviour. Similarly, the other relationships are presented in Table 7.5.

Table 7.5-Departmental layer model 1 inter-item correlations

Factors	Question Items	
Managerial Citizenship Behaviour	MC-D5_1	MC-D5_2
Managerial Citizenship Behaviour	MC-D5_2	MC-D5_4
Managerial Citizenship Behaviour	MC-D5_2	MC-D5_5
Managerial Citizenship Behaviour	MC-D5_5	MC-D5_6
Power Sharing	PS-D6_1	PS-D6_4
Power Sharing	PS-D6_1	PS-D6_5
Power Sharing	PS-D6_4	PS-D6_5
Performance Based Reward Policy	PB-D7_3	PB-D7_4

The inter-item correlations mentioned in the table above are incorporated in SEM model 1 to create model 2. Model 2 is revised model incorporating inter-item correlations based on MI greater than ten. The results of model 2 has improved. CFI value is observed to be 0.9 while the same is 0.8 in model 1. RMSEA is reported to be 0.061 as compared to RMSEA of model 1 0.085. Similarly, SRMR is 0.064 as compared with previous value 0.074. All the indicators discussed above indicate the improvement in model fit results after incorporating inter-item correlations in SEM model.

After the results of model 2 are obtained for the departmental layer, inter-item correlations are checked again and it is observed that now there are no inter-item correlations present in the results. Moreover, the factors also do not have any correlations amongst them. As the next step of application of SEM extensions, the question items with factor loading less than 0.40 is to be excluded from SEM model. The following items are removed from model 2 to develop a revised model named as model 3. Two items are removed from training, TR-O7_3 and TR-O7_4, having factor loadings less than 0.40. The same is given in Table 7.6.

Table 7.6-Departmental layer model 2 items removal factor loadings<0.40

Factor	Question Items	
Training	TR-O7_3	TR-O7_4

The above-mentioned question items are having factor loadings less than 0.40. These question items are removed from the next model; model 3. Then SEM Model 3 is run again to produce results. CFI value is observed as 0.910, GFI as 0.782, TLI is 0.901. Moreover, RMSEA is reported to be 0.059 and SRMR are reported as 0.061. These indicators have improved slightly in comparison with model 2. At this point, the inter-item correlations and inter-factor correlations are checked again and no correlations are observed. Similarly, all the question items are observed to have factor loadings more than or equal to 0.40. As next step, to improve model further, the question items with factor loadings less than 0.50 are removed from model 3. The revised model is called model 4. There is one question item each from two factors having factor loadings less than 0.50; managerial patience D2_1 and managerial citizenship behaviour D5_1. The same information is shared in Table 7.7.

Table 7.7-Departmental layer model 3 items removal factor loadings<0.50

Factors	Question Items
Managerial Patience	MP-D2_1
Managerial Citizenship Behaviour	MC-D5_1

The question items as mentioned above are removed from model 3 to run final model 4. The SEM results show that RMSEA is 0.062 and is significant as compared with model 3 result while SRMR is 0.082. RMSEA is higher than the recommended guideline but within an acceptable range as the data set size on this layer is small. CFI value is observed as 0.906 which is considered to be good, GFI 0.783 and TLI 0.896 are also within a good range. Finally, after applying for SEM extensions on the departmental layer, the results show that all question items are now having factor loadings above 0.50. Moreover, there are no inter-item correlations observed now as they are previously there and also no inter-factor correlations are found. Regarding the usage of ERPS at this layer based on model 4, the results show that there is a slight improvement in the regression coefficients values and adjusted r-squared values. Moreover, all the proposed factors have significant effects on the usage of ERPS. With regards to the coefficients of determination for SEM (Schreiber et al., 2006), performance-based reward policy is showing highest impact (0.94) while management participation in ERPS learning sessions has the lowest (0.59) on the usage of ERPS at the departmental layer. Therefore, all the hypothesised factors included in model 4 are accepted as significant contributors to the usage of ERPS at the departmental layer.

At departmental layer, total of four models are produced. RMSEA is reduced to 0.062 from 0.085 while CFI has improved from 0.8 to 0.906. Similarly, TLI is improved from 0.785 to 0.896 and GFI from 0.707 to 0.783. The regression coefficients and adjusted r-squared values have also improved. For example, the regression coefficient of managerial citizenship behaviour has increased from 0.81 to 0.85 while adjusted r-square of the same has increased from 0.66 to 0.72. The description and results are already explained in detail. The summary of the same is given in Table 7.8 and final SEM diagram for the departmental layer is presented in Figure 7.2.

Table 7.8-Departmental layer SEM extension results

	RMSEA	CFI	TLI	GFI	SRMR	OS Coeff (Ad-r^2)	MP Coeff (Ad-r^2)	AA Coeff (Ad-r^2)	ML Coeff (Ad-r^2)	MC Coeff (Ad-r^2)	PS Coeff (Ad-r^2)	PB Coeff (Ad-r^2)	UD Coeff (Ad-r^2)
Model 1 Base Model	0.085 (p 0.000)	0.800	0.785	0.707	0.074	0.81*** (0.65)	0.88*** (0.78)	0.79*** (0.63)	0.61*** (0.37)	0.81*** (0.66)	0.82*** (0.67)	0.93*** (0.86)	(0.63)
Model 2 Inter Item Correlations	0.061 (p 0.018)	0.900	0.890	0.765	0.064	0.81*** (0.66)	0.88*** (0.77)	0.80*** (0.65)	0.60*** (0.36)	0.84*** (0.71)	0.83*** (0.69)	0.94*** (0.89)	(0.64)
Model 3 Factor Loadings < 0.40	0.059 (p 0.052)	0.910	0.901	0.782	0.061	0.81*** (0.66)	0.88*** (0.77)	0.81*** (0.66)	0.60*** (0.36)	0.84*** (0.71)	0.83*** (0.69)	0.95*** (0.89)	(0.64)
Model 4 Factor Loadings < 0.50	**0.062 (p 0.020)**	**0.906**	**0.896**	**0.783**	**0.082**	**0.81*** (0.66)**	**0.89*** (0.79)**	**0.81*** (0.66)**	**0.59*** (0.35)**	**0.85*** (0.72)**	**0.83*** 0.69**	**0.94*** (0.89)**	**(0.64)**

*** *p < 0.001*

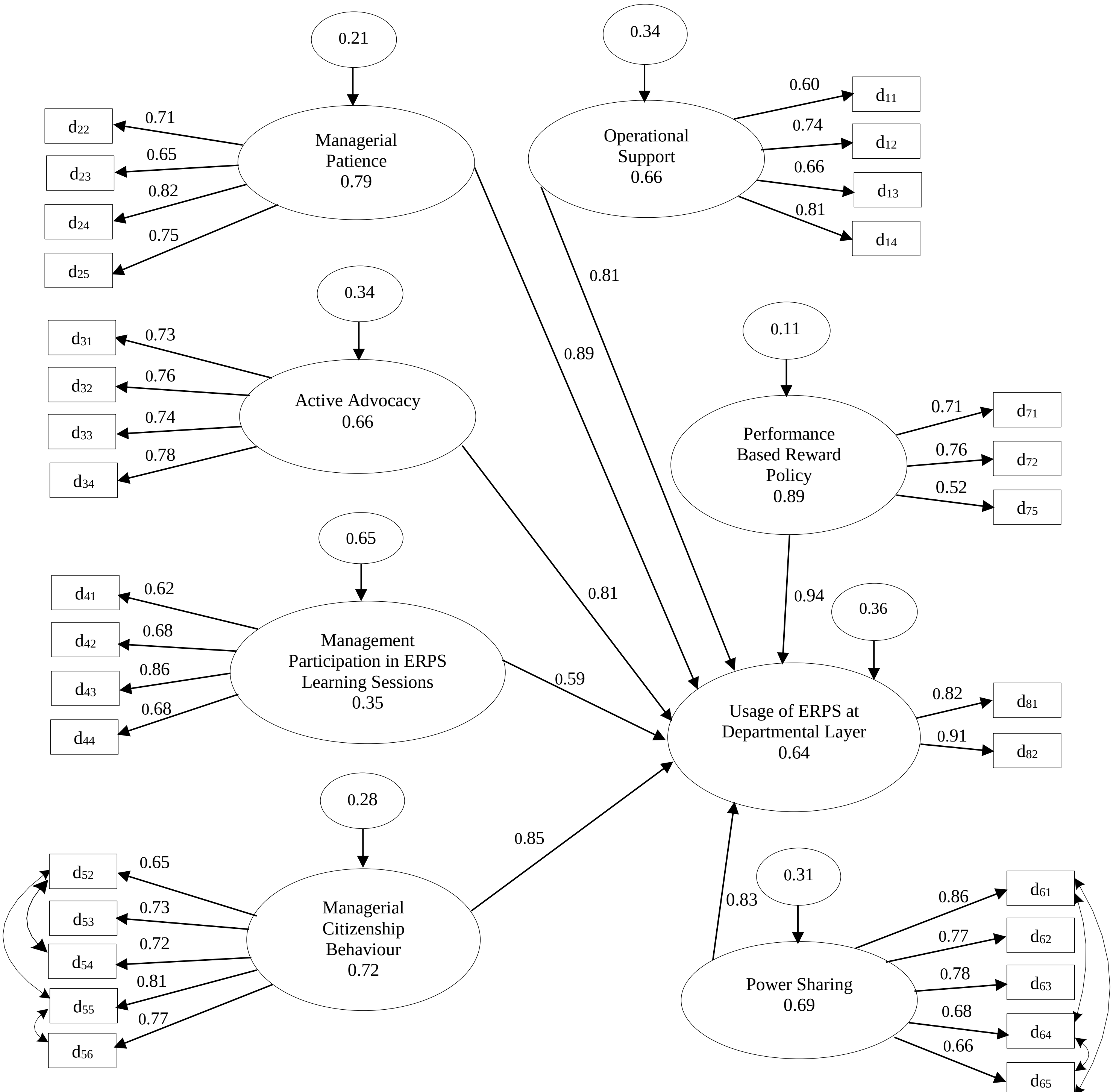

Figure 7.2-Departmental layer SEM extension diagram

7.2.3 End-user layer

For end-user layer, the base model is taken from Chapter 6 named as model 1. The results of model 1 are as follows: CFI 0.80, RMSEA 0.09, and SRMR 0.07. These indicators of model fit produced by SEM have presented a good model fit. The dataset on this layer consists of 1088 responses. As the first step inter-item correlations are observed based on modification indices greater than ten. The items that are found to have correlations among them based on MI greater than ten are from factors E1-Training (TR), E3-Acceptance and Usage of System (AU), E6-Ease of Use (EU) and E7-Usefulness and User Satisfaction (UU). To explain, TR refers to training. TR-E1_1 is placed in the second column having a correlation with TR-E1_2 indicating inter-item correlations between two question items. Similarly, the other relationships are presented in Table 7.9.

Table 7.9-End-user layer model 1 inter-item correlations

Factors	Question Items	
Training	TR-E1_1	TR-E1_2
Training	TR-E1_1	TR-E1_3
Training	TR-E1_1	TR-E1_5
Training	TR-E1_2	TR-E1_3
Training	TR-E1_2	TR-E1_4
Training	TR-E1_2	TR-E1_5
Training	TR-E1_2	TR-E1_6
Training	TR-E1_2	TR-E1_7
Training	TR-E1_3	TR-E1_5
Training	TR-E1_4	TR-E1_5
Training	TR-E1_4	TR-E1_7
Training	TR-E1_6	TR-E1_7
Acceptance and Usage of System	AU-E3_1	AU-E3_2
Acceptance and Usage of System	AU-E3_1	AU-E3_3
Ease of Use	EU-E6_1	EU-E6_2
Ease of Use	EU-E6_1	EU-E6_3

Factors	Question Items	
Usefulness and User Satisfaction	UU-E7_1	UU-E7_2
Usefulness and User Satisfaction	UU-E7_2	UU-E7_4

At end-user layer, inter-item correlations mentioned in the table above are incorporated in SEM model 1 to create model 2. Model 2 is the revised model incorporating inter-item correlations based on MI greater than ten. The results of model 2 has improved. CFI value increased to 0.911 from 0.882. RMSEA reduced to 0.072 as compared to RMSEA of model 1 (0.08). Similarly, SRMR is 0.076 as compared with previous value 0.082. All the indicators discussed above indicate the improvement in model fit results after incorporating inter-item correlations in SEM model. After the results of model 2 are obtained for end-user layer, inter-factor correlations are checked and it is observed that inter-factor correlations are present between training and resistance, training and usefulness and user satisfaction, learning orientation and acceptance and usage of system, learning orientation and resistance, learning orientation and ease of use, and finally between acceptance and usage of system with resistance. The relationships are reported in Table 7.10.

Table 7.10-End-user layer model 2 inter-factor correlations

Factor 1	Factor 2
Training	Resistance
Training	Usefulness and User Satisfaction
Learning Orientation	Acceptance and Usage of System
Learning Orientation	Resistance
Learning Orientation	Ease of Use
Acceptance and Usage of System	Resistance

After incorporating inter-factor correlations, model 3 is produced. The results of model 3 has further improved. CFI value increased to 0.922 from 0.911. Similarly, TLI is improved to 0.907 from 0.895 and GFI from 0.847 to 0.869. RMSEA is reported 0.067 and it is improved from 0.072. Similarly, SRMR is 0.068 as compared with previous value 0.076. All the indicators discussed above show the improvement in model fit results after incorporating inter-factor correlations in SEM model.

After the results of model 3 are produced for this layer, inter-item correlations and inter-factor correlations are checked again to observe any changes arising due to incorporating of inter-item and inter-factor correlations. The following items are observed to have correlations among them, all the items mentioned here are from training factor; question item one is having a correlation with question item three and question item two is linked with question item four as presented in Table 7.11.

Table 7.11-End-user layer model 3 additional inter-item correlations

Factors	Question Items	
Training	TR-E1_1	TR-E1_3
Training	TR-E1_2	TR-E1_4

Moreover, few inter-factor correlations are also observed from results of SEM model 3. Training is found to be having a correlation with acceptance and usage of the system, participation and support, and ease of use while resistance is correlated with usefulness and user satisfaction. The results are showed in Table 7.12.

Table 7.12-End-user layer model 3 additional inter-factor correlations

Factor 1	Factor 2
Training	Acceptance and Usage of System
Training	Participation and Support
Training	Ease of Use
Resistance	Usefulness and User Satisfaction

The above mentioned inter-item and inter-factor correlations are incorporated to develop SEM model 4 for the end-user layer. The results of model 4 are obtained and it is observed that results are slightly improved. RMSEA is reported to be 0.065 and SRMR is 0.059 in comparison with 0.068 in model 3.

The results of model 4 are tested for correlations among items and correlations among factors. There are no inter-item correlations reported in results of model 4, however, there are few inter-factor correlations observed. The inter-factor correlation are presented in Table 7.13.

Table 7.13-End-user layer model 4 additional inter-factor correlations

Factor 1	Factor 2
Acceptance and Usage of System	Usefulness and User Satisfaction
Ease of Use	Usefulness and User Satisfaction
Ease of Use	Resistance
Ease of Use	Participation and Support

The above-mentioned changes are incorporated into SEM model 5 and results are obtained. RMSEA is reported to be 0.064 and SRMR 0.056. CFI 0.933, TLI 0.917 and GFI 0.883, all indicating improvement in the results of this model.

The results of model 5 are evaluated again and it is observed that there are no inter-item correlations as well as no inter-factor correlations. Furthermore, factor loadings of all the question items are checked and all factor loadings are found to be greater than or equal to 0.50. Hence, there is no need to develop a revised model and model 5 is considered as a final model for the end-user layer. The final model has also produced the regression confident values, adjusted r-squared values in addition to the model fit indicators. At end user layer, usage of ERPS results is also calculated by the final model. The results show significant improvement in regression coefficients and adjusted r-squared values of the factors in the final model. For example, in model 1, the coefficient of training is 0.39 which has increased to 0.61 in model 5, similarly, adjusted r-square has increased from 0.15 to 0.37. With regards to the coefficients of determination for SEM (Schreiber et al., 2006), all factors are significant. The factor usefulness and user satisfaction with highest regression coefficient 0.93 with adjusted r-squared value 0.87, while lowest is observed in resistance with regression coefficient 0.34 and adjusted r-square of 0.12. Therefore, all the hypothesised factors are accepted as a contributor to the usage of ERPS at the end-user layer. The following table is presenting the step by step development of all four models at the end-user layer. The process is started from model 1 that is the base model and is ended at model 5 called as the final model. RMSEA is reduced to 0.064 from 0.080 while CFI improved from 0.882 to 0.933. Similarly, TLI is improved from 0.868 to 0.917 and GFI from 0.807 to 0.883. The regression coefficients and adjusted r-squared values have also improved. For example, the regression coefficient of ease of use has increased from 0.75 to 0.89 and adjusted r-square has increased from 0.57 to 0.80. The summary of the same is given in Table 7.14 and then presented graphically in Figure 7.3.

Table 7.14-End-user layer SEM extension results

	RMSEA	**CFI**	**TLI**	**GFI**	**SRMR**	**TR Coeff (Ad-r^2)**	**LO Coeff (Ad-r^2)**	**AU Coeff (Ad-r^2)**	**PS Coeff (Ad-r^2)**	**RE Coeff (Ad-r^2)**	**EU Coeff (Ad-r^2)**	**UU Coeff (Ad-r^2)**	**UE Coeff (Ad-r^2)**
Model 1 Base Model	0.080 (p 0.000)	0.882	0.868	0.807	0.082	0.39*** (0.15)	0.58*** (0.34)	0.80*** (0.64)	0.46*** (0.21)	0.62*** (0.38)	0.75*** (0.57)	0.92*** (0.85)	(0.50)
Model 2 Inter Item Correlations	0.072 (p 0.000)	0.911	0.895	0.847	0.076	0.43*** (0.19)	0.58*** (0.33)	0.78*** (0.61)	0.46*** (0.22)	0.61*** (0.38)	0.78*** (0.61)	0.92*** (0.85)	(0.50)
Model 3 Inter Factor Correlations	0.067 (p 0.000)	0.922	0.907	0.869	0.068	0.47*** (0.22)	0.52*** (0.27)	0.64*** (0.41)	0.47*** (0.22)	0.56*** (0.31)	0.76*** (0.58)	0.96*** (0.92)	(0.53)
Model 4 Additional Inter Item &Inter Factor Correlations	0.065 (p 0.000)	0.930	0.914	0.877	0.059	0.60*** (0.35)	0.52*** (0.28)	0.69*** (0.47)	0.47*** (0.22)	0.47*** (0.22)	0.78*** (0.62)	0.94*** (0.88)	(0.55)
Model 5 Additional Inter Factor Correlations	**0.064 (p 0.000)**	**0.933**	**0.917**	**0.883**	**0.056**	**0.61*** (0.37)**	**0.52*** (0.27)**	**0.56*** (0.32)**	**0.47*** (0.22)**	**0.34*** (0.12)**	**0.89*** (0.80)**	**0.93*** (0.87)**	**(0.54)**

*** $p < 0.001$

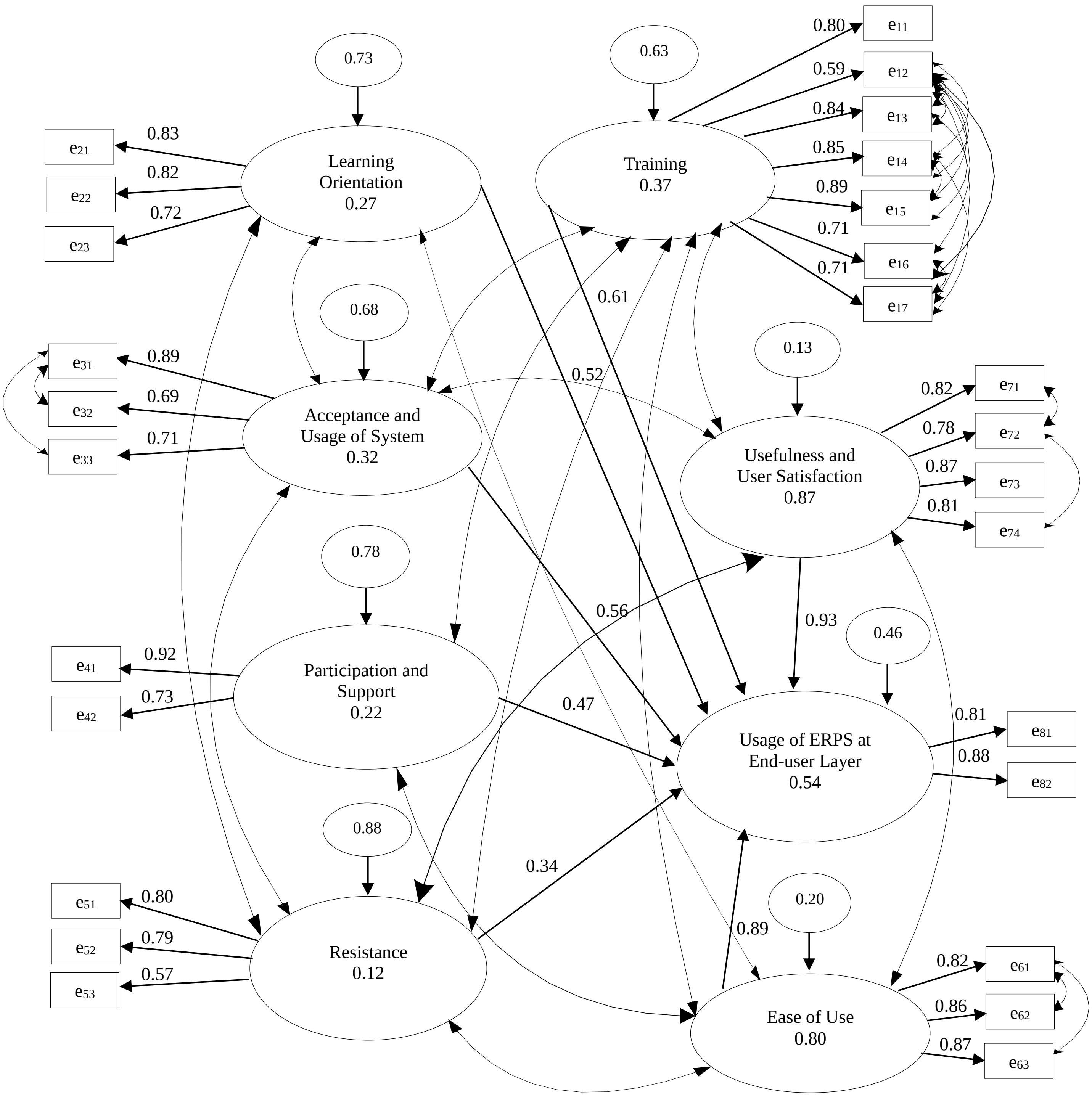

Figure 7.3-End-user layer SEM extension diagram

7.3 Summary

Using SEM extension techniques, the models of all three layer are refined; organisational, departmental and end-user. The techniques implied on the data are finding inter-item correlations to incorporate in the existing model for improving results. Similarly, another technique of finding inter-factor correlations and integrating these into the models has also improved the overall results significantly. The results include model fit indicators, regression coefficients and adjusted r-squared values.

At organisational layer, four models are used to obtain the objective of having better results. The first model is named model 1, the second model has incorporated inter-item correlations. The third models has taken care of the question items with factor loadings of less than 0.40. The final model has dealt with factor removal of the question item having factor loading of less than 0.50. The results at organisational layer have improved by using all these techniques of SEM extensions.

The application of SEM extensions on departmental layer has gone through refinement of four models. As on organisational layer, the base model is taken from Chapter 6 and considered as the first model to start with. This final model produced better results than the first model.

The end-user layer has dealt in the same way as taking the base model considering it first model to start application of SEM extension techniques. Starting from the first model till final model, total of five models are developed. The second model has controlled correlations among items and the third model has taken care of inter-factor correlations present in the results. The next model has used to incorporate additional inter-item correlations and correlations among factors found in the results of the third model. After the results of the fourth model are produced, few more inter-factor correlations are observed and tackled in the final model. The results produced by model five are better than the results of the first model in terms of model fit indicators, regression coefficients and values of adjusted r-squares.

Organisational layer with sample size is 86. At this layer, the model originally held 47 items while after refinement it contains 28 question items. At departmental layer, the sample size is 143 and the number of items in the questionnaire before applying SEM extensions is 35, now reduced to 31 as four question items are removed due to having factor loadings less than 0.50. The end-user layer with sample size 1088 and having 27 question items has remained unchanged.

Chapter 8. Conclusions

8.1 Introduction

Current literature suggested that there was limited research on the usage of information systems. The aim of this research was to examine the factors that contribute to the usage of ERPS across the organisational, the departmental and the end-user layer in higher education sector. It first provided an overview of the literature on the usage of innovation and then constructed a conceptual model that suggested a multi-level examination of the factors of usage. Three research questionnaires were designed to examine the factors of usage across the three layers, i.e., organisational, departmental and end-user layer. Layder's (1993) research map was adopted for the conceptual and methodological framework. For this study, 26 research hypotheses were formulated and 21 hypotheses are proved significant.

8.2 Discussion

Empirical data for the pilot study was collected from one HEI through 131 responses across three distinct questionnaires for each of the three layers. The three layers are not directly linked as they hold distinct factors to be explored. The factors for the organisational, departmental and end-user layers are extracted for the relevant layers from the extensive literature review and are based on the evidence from the literature. Based on the statistical data analysis in R, the empirical findings showed that human resource availability, tolerance for conflicts and risks, collegial support and collaboration, decision making and control, organisational alignment, training, and benefits realisation affected the usage of ERPS in HEI at the organisational layer. However, organisational culture and setting up learning structure did not contribute to the usage of ERPS in HEI at this layer. However, three more factors were dropped to adjust the number of variables due to lower sample size. The factors include organisational alignment, training and benefit realisation. At the departmental layer, the empirical findings showed that operational support, managerial patience, active advocacy, management participation in ERPS learning sessions, management citizenship behaviour, power sharing, and performance based reward policy contributed to the usage of ERPS in HEI. Finally, at the end-user layer, the findings showed that training, learning orientation, acceptance and usage of system, participation and support, resistance, ease of use, and usefulness and user satisfaction contributed to the usage of ERPS in HEI while behavioural intention and motivation did not prove to be significant.

Later, empirical data for the full study was collected from eighteen HEIs. A total of 1317 responses were used for data analysis, from three separate questionnaires. Structural equation modelling was employed for data analysis using R. The model fit indices; RMSEA, CFI, GLI, TLI, SRMR; at the departmental and end-user layers presented a good model fit. SEM results also demonstrated that human resource availability, tolerance for conflicts and risks, collegial support and collaboration, decision making and control, organisational alignment, training and benefits realisation affected the usage of ERPS in HEI at the organisational layer. At the departmental layer, the findings showed that all the factors; operational support, managerial patience, active advocacy, management participation in ERPS learning sessions, management citizenship behaviour, power sharing, and performance based reward policy; were significant. Finally, at the end-user layer, all the hypothesised factors contributed significantly to ERPS usage at this layer; training, learning orientation, acceptance and usage of the system, participation and support, resistance, ease of use and usefulness and user satisfaction. Furthermore, overall ERPS usage was calculated based on two question items. These question items were same on all layers used to measure usage of ERPS in HEIs. Moreover, comparison among HEIs was also made regarding ERPS usage in the respective higher education institutions.

Further, SEM extensions were applied for model refinement. Inter-item correlations and inter-factor correlations were explored based on the value of modification indices. The process was used to improve model fit indicators to find the best model fit. At organisational layer, model fit indicators were improved by applying for SEM extensions; CFI was raised to 0.68 from 0.56, TLI 0.65 from 0.53, GFI 0.61 from 0.55. Similarly, a slight improvement was observed in regression coefficients of the factors involved. At departmental layer, RMSEA was 0.09 that was improved to 0.06 after application of SEM extensions. Similarly, CFI improved to 0.91 from 0.80, TLI 0.90 from 0.79 and GFI 0.78 from 0.71. Moreover, a slight improvement was observed in factors' regression values. At end-user layer, RMSEA performed better from 0.08 to 0.06. Furthermore, the other indicators of model fit also showed improvement similar to departmental layer. Then regression coefficient had significantly improved at end-user layer e.g. training increased to 0.61 from 0.39 and adjusted r-square has increased from 0.50 to 0.54.

8.3 Research contributions

Firstly, it contributes to the literature by identifying drivers of ERPS usage at three distinct layers of organisation, which to the best of the researcher's knowledge is the first study of its kind.

The study identified conditions occurring simultaneously at three organisational levels of an organisation to contribute towards ERPS usage i.e. organisational, departmental and end-user levels. The work on three simultaneous levels had been undertaken in this study for the first time. Previous studies had focused on one section at a time (Rajapakse and Seddon, 2005, Kanwal and Manarvi, 2010, Shah et al., 2011, Riaz et al., 2014). Few studies had also focused on higher education (Pollock and Williams, 2009, Abbas, 2011, Shah et al., 2011, Shad et al., 2012, Waring and Skoumpopoulou, 2012, Huda and Hussin, 2013, Nizamani et al., 2014). Abbas (2011) written a PhD dissertation focusing on factors affecting ERPS successful utilisation and maximisation of benefits of the system implementation. He compared two higher education institutions of UK but the other studies were only been limited to one higher education institution. Moreover, the concept of the organisational layer was not discussed. Similarly, Thatcher (2006) conducted a multilevel analysis but this was about e-commerce diffusion in Taiwan. This study brought together factors affecting ERPS usage from a diverse set of studies, as discussed in detail in Table 2.4 to Table 2.6, which were explored in isolation, whereas this study developed a comprehensive framework of exploring these factors at one time at three distinct levels. Moreover, factors of ERPS usage selected on the basis of their previous evidence existing in the literature of higher education sector or corporate sector as presented in Table 2.3. UTAUT was used as a base model that is extended to this study and validated.

This study identified an under-researched topic, i.e., usage of ERPS in higher education sector of Pakistan. It offers original contributions to knowledge in multiple dimensions. The indigenous manifestations of ERPS usage contribute to theory development in the under-researched context of HEIs. It also informs research in other contexts. It also addresses Carlsson's (2004) calls to use Layder's (1993) research map in IS research as a tool to synthesise a large number of variables in developing a unique multi-layered conceptual model for examining the usage of ERPS.

In terms of contribution to methodology, the study proposed a multi-layer model and developed three distinct questionnaires for primary data collection to examine the usage of ERPS at the organisational, the departmental and the end-user layers in HEIs. After full data collection, SEM techniques and extensions were applied to examine the usage of ERPS in higher education context remains neglected to date. Also, overall usage of ERPS in HEIs was estimated using information derived from three layers.

In terms of contribution to policy, suggestions based on the findings of the study are to be disseminated to HEC and top management of each HEI. HEC and top management of HEIs may take the steps to enhance the usage of ERPS in higher education sector. This study is unique in providing Higher Education Commission of Pakistan and Pakistani HEIs with an understanding of the significant factors in the usage of ERPS from a multi-level perspective within the organisation. The factors identified as significantly affecting the usage of ERPS can also help in allocating strategic resources by the policy makers in the field. Furthermore, the findings of this research can inform the top management within the HEI to address enablers or inhibitors of the usage of ERPS specific to the university.

Summarising research contribution, this is the first study of its kind focusing on the usage of ERPS in HEIs across three layers of each HEI. Moreover, conceptual multi-layer model is devised and data collected was large in number, 1317 respondents from the organisational, the departmental and the end-user layers. SEM and SEM extensions are applied on the large data set of three layers from 18 HEIs making this study unique that have never been discussed earlier in the literature.

8.4 Research significance

This study intends to provide HEIs with an understanding of the significant factors in the diffusion of ERPS from a multi-level perspective. It also contributes to theory development regarding usage of innovations in the under-researched context of HEIs and provides indigenous manifestations of ERPS usage that may be utilised at large by policy-makers of higher education sector. The findings of the research can be used to highlight key areas that need the attention of policy makers, and help in strategic allocation of resources for ERPS usage. Furthermore, the top management of HEIs may use the findings of this research to address the issues local to the HEI and help in overcoming the hurdles to ERPS usage at the end-user layer; and eventually, the implementation of refined policies may speed up effective utilisation of ERPS in HEIs of Pakistan.

8.5 Research limitations

Empirical data for this study was collected from the higher education sector of Pakistan; therefore, the findings of the study may not be necessarily generalisable to other sectors or countries. Nevertheless, the conceptual model developed in the study may be used to examine the usage of ERPS in other countries and in other sectors as well. With regards to the data collection, large physical distances between the universities in Pakistan was a major challenge. Also, terrorism and security issues in Baluchistan and Sindh (two provinces of Pakistan) inhibited the researcher from visiting higher education institutions in these provinces.

The Conceptual Framework presented a review of the existing research in ERPS field, there was limited research on ERPS in the higher education sector and similarly in the Pakistani context. This posed difficulties in comparing the findings of the current study with other similar research. Also, limitation of the study is the availability of staff for responding to the questionnaires. As their participation was voluntary, therefore not everyone was expected to agree to participate in the research. The final limitation of the study was the authenticity of the primary data collected: the information collected from the institutions and end-users were assumed, to be honest.

Further, the current study only focused on higher education sector and research on ERPS in HEIs is extremely scant. This is limiting the ability to compare the research findings with previous studies. Moreover, during the research design, the researcher was conscious of the difficulties in acquiring access to the universities for data collection.

8.6 Ethical considerations

The research was conducted in line with the ethical principles, including informed consent, privacy, anonymity and confidentiality, as per the considerations of the research ethics policy of the University of Hertfordshire. Written ethical approval was obtained from the UH Research Ethics Committee. The purpose of the research study was explained to the respondents and their informed consent was obtained prior to any primary data collection. The potential respondents approached for the study were given the right to refuse their participation; their participation was voluntary and they are having the right to withdraw their responses from the research at any stage. Anonymity and confidentiality of the respondents and their organisations was fully respected and adequate measures were taken for data protection; filled questionnaires were placed under lock and key and data on the computer is password protected. The respondents were also informed that they can keep a copy of their questionnaires for their personal records.

8.7 Future directions

In future, the conceptual model may be used to apply in higher education sector of other countries. Similarly, the same can be applied to corporate sector globally. Moreover, the study may be replicated in provinces of Baluchistan and Sindh in Pakistan. Currently, these provinces are not declared safe to visit due to terrorism. Furthermore, SEM techniques and extensions may be extended further in examining the usage of ERPS. Moreover, a qualitative study may be more helpful in suggesting changes in the policy making enhance the ERPS usage. Finally, the model presented in the study may be replicated or adapted for cross-sector and cross-cultural comparisons.

8.8 Recommendations

The study identified the factors contributing to the usage of ERPS in HEIs in Pakistan. The study also addressed the aspects that need the attention of the controlling body and policy makers in the industry. Top management of higher education institutions needs to address the issues of end-users to increase ERPS usage in the organisation e.g., they are not rewarded properly on their performance. Organisational layer results showed that technical human resource available in HEIs is below satisfactory level and it is suggested to strengthen this area. The investment in hiring new human resource that is proficient in handling ERPS across the organisation can lead to increase in ERPS usage as it may help the end-users to get their issues resolved efficiently. Further, clear conflict resolution policy needs to be implemented to resolve any administrative conflicts arising during the ERPS service providing to end-users of HEIs. It is also recommended to include all stakeholders while making decisions for the users of ERPS. This can help in reducing the resistance to implementing any new policies regarding ERPS usage in the HEI. Furthermore, there is need to provide more training to ERPS users to incorporate usage of ERPS in daily routine tasks. The results also suggested that ERPS users were not satisfied with the training provided by the HEI. It is strongly recommended to arrange awareness sessions and provide hands-on training to the teachers and employees of higher education institutions. Potentially, this is the most important point and it may prove to be the key to increasing usage of ERPS.

The role of departmental heads is also very important as the head is responsible for implementing the policies in a way that is practical and focused on efficiently achieving the desired target. More operational support is required by the head of the department. It is important that head is willing to promote the agenda by getting involved beyond the call of duty. There is a need of improvement in the behaviour of the unit heads regarding sharing of power to sub-units level, motivating the staff to use ERPS in daily routine and participating in any activity arranged to enhance ERPS usage. It is also suggested to attach performance-based rewards for efficient staff to increase the usage of ERPS.

8.9 Summary

The aim of this research was to examine the factors that contribute to the ERPS usage. For this purpose data was collected from Pakistani HEIs across the organisational, the departmental and the end-user layers. A multi-level model was proposed to examine the factors affecting usage of ERPS in HEIs in Pakistan. The data analysis suggested that 18 out of 26 research hypotheses were proved significant and were accepted. In total, 18 HEIs were visited to collect data. Basic data analysis techniques were applied to extract meaningful results and finally, structural equation modelling is used to get the model fit of the organisational, the departmental and the end-user layer. Furthermore, models were refined using extensions of structural equation modelling.

This study contributes to the knowledge in terms of theory development. It also contributes to methodology as the study incorporated multi-layer model at three layers of the same organisation. Furthermore, it also provides guidelines to policy makers in HEI-industry to increase the ERPS usage in public and private sector HEIs in Pakistan.

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Appendix A-Tables

Table A.1-Data collection

HEI ID	HEI Name	City	Date of Visit (2015)	Sector	Questionnaires Distributed			Questionnaires Collected					
					ORG	DEP	EU	ORG	%	DEP	%	EU	%
				TOTAL	**124**	**209**	**1844**	**86**	**69%**	**143**	**68%**	**1088**	**59%**
HE01	University of the Punjab	Lahore	multiple visits on various dates	Public	10	43	160	8	**80%**	34	**79%**	141	**88%**
HE02	Quaid-e-Azam University	Islamabad	18-May	Public	6	2	60	4	**67%**	2	**100%**	19	**32%**
HE03	Islamia University	Bahawalpur	14-Apr to 19-Apr	Public	8	25	87	7	**88%**	10	**40%**	64	**74%**
HE04	COMSATS-Sahiwal	Sahiwal	13-Apr	Public	5	5	71	3	**60%**	2	**40%**	20	**28%**
HE05	COMSATS-Vehari	Vehari	20-Apr	Public	5	5	83	4	**80%**	5	**100%**	70	**84%**
HE06	COMSATS-Islamabad	Islamabad	5 visits on various dates	Public	4	3	97	4	**100%**	2	**67%**	88	**91%**
HE07	COMSATS-Wah	Wah	19-May	Public	3	3	72	2	**67%**	3	**100%**	54	**75%**
HE08	COMSATS-Abbottabad	Abbottabad	21-May	Public	5	4	130	4	**80%**	3	**75%**	59	**45%**
HE09	COMSATS-Attock	Attock	20-May	Public	5	4	118	5	**100%**	3	**75%**	55	**47%**
HE10	COMSATS-Lahore	Lahore	multiple visits in June, July, August	Public	6	10	180	4	**67%**	9	**90%**	151	**84%**
HE11	University of Central Punjab	Lahore	multiple visits in June, July, August	Private	7	20	241	5	**71%**	12	**60%**	130	**54%**

HEI ID	**HEI Name**	**City**	**Date of Visit (2015)**	**Sector**	**Questionnaires Distributed**			**Questionnaires Collected**					
					ORG	**DEP**	**EU**	**ORG**	**%**	**DEP**	**%**	**EU**	**%**
HE12	Shaheed Zulafqar Ali Bhutto Institute of Science and Technology	Islamabad	12-May	Private	5	8	67	4	**80%**	7	**88%**	23	**34%**
HE13	University of Lahore	Lahore	multiple visits in June, July, August	Private	10	10	100	6	**60%**	8	**80%**	41	**41%**
HE14	Bahria University	Islamabad	18-May	Public	10	10	49	6	**60%**	6	**60%**	17	**35%**
HE15	Iqra University	Islamabad	13-May	Private	3	5	76	1	**33%**	3	**60%**	9	**12%**
HE16	Agriculture University	Faisalabad	25-May	Public	10	20	70	6	**60%**	15	**75%**	35	**50%**
HE17	Government College University	Faisalabad	25-May	Public	12	20	123	7	**58%**	13	**65%**	103	**84%**
HE18	National Textile University	Faisalabad	25-May	Public	10	12	60	6	**60%**	7	**58%**	15	**25%**
REMOVED RECORDS WITH SD=0								**0**		**1**		**6**	

Table A.2-T-test organisational layer sector

		Levene's Test for Equality of Variances		t-test for Equality of Means		
		F	Sig.	t	df	Sig. (2-tailed)
Human resource availability	Equal variances assumed	1.806	.183	-3.925	84	.000
	Equal variances not assumed			-4.017	30.852	.000
Tolerance for risks and conflicts	Equal variances assumed	5.315	.024	-1.478	84	.143
	Equal variances not assumed			-1.761	52.834	.084
Collegial support and collaboration	Equal variances assumed	5.251	.024	-2.440	84	.017
	Equal variances not assumed			-2.747	46.260	.009
Decision making and control	Equal variances assumed	2.947	.090	-3.086	84	.003
	Equal variances not assumed			-3.611	50.589	.001
Organisational alignment	Equal variances assumed	.011	.916	-1.847	84	.068
	Equal variances not assumed			-1.799	34.866	.081
Trainings	Equal variances assumed	.290	.592	-2.049	84	.044
	Equal variances not assumed			-1.803	30.004	.081
Benefit realisation	Equal variances assumed	1.778	.186	-1.914	84	.059
	Equal variances not assumed			-1.994	39.328	.053
Usage of ERPS at organisational layer	Equal variances assumed	11.935	.001	-2.184	84	.032
	Equal variances not assumed			-2.648	55.204	.011

Table A.3-T-test organisational layer category

	Category	N	Mean	Std. Deviation	Std. Error Mean
Human resource availability	Teacher	0[a]	.	.	.
	Employee	86	3.7766	.55929	.06031
Tolerance for risks and conflicts	Teacher	0[a]	.	.	.
	Employee	86	3.7908	.51907	.05597
Collegial support and collaboration	Teacher	0[a]	.	.	.
	Employee	86	3.8488	.68522	.07389
Decision making and control	Teacher	0[a]	.	.	.
	Employee	86	3.8116	.49856	.05376
Organisational alignment	Teacher	0[a]	.	.	.
	Employee	86	3.7169	.66198	.07138
Trainings	Teacher	0[a]	.	.	.
	Employee	86	3.8197	.62891	.06782
Benefit realisation	Teacher	0[a]	.	.	.
	Employee	86	3.8203	.60735	.06549
Usage of ERPS at organisational layer	Teacher	0[a]	.	.	.
	Employee	86	3.9070	.87283	.09412

Table A.4-T-test organisational layer gender

		Levene's Test for Equality of Variances		t-test for Equality of Means		
		F	Sig.	t	df	Sig. (2-tailed)
Human resource availability	Equal variances assumed	2.551	.114	.621	84	.536
	Equal variances not assumed			.842	12.502	.416
Tolerance for risks and conflicts	Equal variances assumed	1.490	.226	-.712	84	.478
	Equal variances not assumed			-.907	11.767	.382
Collegial support and collaboration	Equal variances assumed	3.116	.081	-.826	84	.411
	Equal variances not assumed			-1.319	15.426	.206
Decision making and control	Equal variances assumed	2.635	.108	-1.389	84	.168
	Equal variances not assumed			-2.256	15.860	.039
Organisational alignment	Equal variances assumed	.016	.899	-.817	84	.416
	Equal variances not assumed			-.862	10.265	.408
Trainings	Equal variances assumed	.097	.756	-.163	84	.871
	Equal variances not assumed			-.153	9.667	.881
Benefit realisation	Equal variances assumed	.278	.599	1.289	84	.201
	Equal variances not assumed			1.233	9.752	.246
Usage of ERPS at organisational layer	Equal variances assumed	1.773	.187	.467	84	.642
	Equal variances not assumed			.392	9.247	.704

Table A.5-Anova organisational layer age

		Sum of Squares	df	Mean Square	F	Sig.
Human resource availability	Between Groups	2.240	8	.280	.885	.533
	Within Groups	24.349	77	.316		
	Total	26.589	85			
Tolerance for risks and conflicts	Between Groups	1.774	8	.222	.808	.597
	Within Groups	21.128	77	.274		
	Total	22.902	85			
Collegial support and collaboration	Between Groups	3.402	8	.425	.897	.523
	Within Groups	36.507	77	.474		
	Total	39.910	85			
Decision making and control	Between Groups	.568	8	.071	.266	.975
	Within Groups	20.559	77	.267		
	Total	21.127	85			
Organisational alignment	Between Groups	2.131	8	.266	.584	.788
	Within Groups	35.118	77	.456		
	Total	37.248	85			
Trainings	Between Groups	3.011	8	.376	.947	.484
	Within Groups	30.609	77	.398		
	Total	33.620	85			
Benefit realisation	Between Groups	5.500	8	.687	2.048	.052
	Within Groups	25.854	77	.336		
	Total	31.354	85			
Usage of ERPS at organisational layer	Between Groups	5.498	8	.687	.893	.527
	Within Groups	59.258	77	.770		
	Total	64.756	85			

Table A.6-Anova organisational layer education

		Sum of Squares	df	Mean Square	F	Sig.
Human resource availability	Between Groups	4.049	3	1.350	4.910	.003
	Within Groups	22.539	82	.275		
	Total	26.589	85			
Tolerance for risks and conflicts	Between Groups	3.672	3	1.224	5.220	.002
	Within Groups	19.230	82	.235		
	Total	22.902	85			
Collegial support and collaboration	Between Groups	3.439	3	1.146	2.577	.059
	Within Groups	36.471	82	.445		
	Total	39.910	85			
Decision making and control	Between Groups	.969	3	.323	1.314	.276
	Within Groups	20.159	82	.246		
	Total	21.127	85			
Organisational alignment	Between Groups	2.067	3	.689	1.606	.194
	Within Groups	35.182	82	.429		
	Total	37.248	85			
Trainings	Between Groups	2.231	3	.744	1.943	.129
	Within Groups	31.389	82	.383		
	Total	33.620	85			
Benefit realisation	Between Groups	1.822	3	.607	1.687	.176
	Within Groups	29.532	82	.360		
	Total	31.354	85			
Usage of ERPS at organisational layer	Between Groups	4.686	3	1.562	2.132	.102
	Within Groups	60.070	82	.733		
	Total	64.756	85			

Table A.7-Anova organisational layer total experience

		Sum of Squares	df	Mean Square	F	Sig.
Human resource availability	Between Groups	3.265	4	.816	2.835	.030
	Within Groups	23.324	81	.288		
	Total	26.589	85			
Tolerance for risks and conflicts	Between Groups	1.779	4	.445	1.706	.157
	Within Groups	21.123	81	.261		
	Total	22.902	85			
Collegial support and collaboration	Between Groups	3.256	4	.814	1.799	.137
	Within Groups	36.654	81	.453		
	Total	39.910	85			
Decision making and control	Between Groups	2.370	4	.592	2.558	.045
	Within Groups	18.758	81	.232		
	Total	21.127	85			
Organisational alignment	Between Groups	3.166	4	.792	1.881	.122
	Within Groups	34.082	81	.421		
	Total	37.248	85			
Trainings	Between Groups	3.156	4	.789	2.098	.089
	Within Groups	30.464	81	.376		
	Total	33.620	85			
Benefit realisation	Between Groups	2.323	4	.581	1.621	.177
	Within Groups	29.031	81	.358		
	Total	31.354	85			
Usage of ERPS at organisational layer	Between Groups	6.574	4	1.643	2.288	.067
	Within Groups	58.182	81	.718		
	Total	64.756	85			

Table A.8-Anova organisational layer experience in HEIs

		Sum of Squares	df	Mean Square	F	Sig.
Human resource availability	Between Groups	2.851	4	.713	2.432	.054
	Within Groups	23.738	81	.293		
	Total	26.589	85			
Tolerance for risks and conflicts	Between Groups	.819	4	.205	.751	.560
	Within Groups	22.082	81	.273		
	Total	22.902	85			
Collegial support and collaboration	Between Groups	2.393	4	.598	1.291	.280
	Within Groups	37.517	81	.463		
	Total	39.910	85			
Decision making and control	Between Groups	1.297	4	.324	1.324	.268
	Within Groups	19.830	81	.245		
	Total	21.127	85			
Organisational alignment	Between Groups	2.128	4	.532	1.227	.306
	Within Groups	35.120	81	.434		
	Total	37.248	85			
Trainings	Between Groups	4.204	4	1.051	2.894	.027
	Within Groups	29.417	81	.363		
	Total	33.620	85			
Benefit realisation	Between Groups	2.031	4	.508	1.402	.241
	Within Groups	29.323	81	.362		
	Total	31.354	85			
Usage of ERPS at organisational layer	Between Groups	4.652	4	1.163	1.567	.191
	Within Groups	60.104	81	.742		
	Total	64.756	85			

Table A.9-Anova organisational layer experience in current HEI

		Sum of Squares	df	Mean Square	F	Sig.
Human resource availability	Between Groups	1.114	4	.278	.885	.477
	Within Groups	25.475	81	.315		
	Total	26.589	85			
Tolerance for risks and conflicts	Between Groups	.315	4	.079	.283	.888
	Within Groups	22.586	81	.279		
	Total	22.902	85			
Collegial support and collaboration	Between Groups	2.181	4	.545	1.171	.330
	Within Groups	37.728	81	.466		
	Total	39.910	85			
Decision making and control	Between Groups	.647	4	.162	.640	.636
	Within Groups	20.481	81	.253		
	Total	21.127	85			
Organisational alignment	Between Groups	1.795	4	.449	1.025	.399
	Within Groups	35.453	81	.438		
	Total	37.248	85			
Trainings	Between Groups	3.755	4	.939	2.546	.046
	Within Groups	29.865	81	.369		
	Total	33.620	85			
Benefit realisation	Between Groups	1.412	4	.353	.955	.437
	Within Groups	29.942	81	.370		
	Total	31.354	85			
Usage of ERPS at organisational layer	Between Groups	4.870	4	1.217	1.647	.171
	Within Groups	59.886	81	.739		
	Total	64.756	85			

Table A.10-Anova organisational layer experience using ERPS

		Sum of Squares	df	Mean Square	F	Sig.
Human resource availability	Between Groups	2.610	4	.653	2.204	.076
	Within Groups	23.978	81	.296		
	Total	26.589	85			
Tolerance for risks and conflicts	Between Groups	2.189	4	.547	2.140	.083
	Within Groups	20.713	81	.256		
	Total	22.902	85			
Collegial support and collaboration	Between Groups	3.620	4	.905	2.020	.099
	Within Groups	36.289	81	.448		
	Total	39.910	85			
Decision making and control	Between Groups	1.088	4	.272	1.099	.363
	Within Groups	20.040	81	.247		
	Total	21.127	85			
Organisational alignment	Between Groups	1.240	4	.310	.698	.596
	Within Groups	36.008	81	.445		
	Total	37.248	85			
Trainings	Between Groups	1.567	4	.392	.990	.418
	Within Groups	32.053	81	.396		
	Total	33.620	85			
Benefit realisation	Between Groups	2.687	4	.672	1.898	.119
	Within Groups	28.667	81	.354		
	Total	31.354	85			
Usage of ERPS at organisational layer	Between Groups	7.820	4	1.955	2.781	.032
	Within Groups	56.936	81	.703		
	Total	64.756	85			

Table A.11-T-test departmental layer sector

		Levene's Test for Equality of Variances		t-test for Equality of Means		
		F	Sig.	t	df	Sig. (2-tailed)
Operational support	Equal variances assumed	10.426	.002	3.542	141	.001
	Equal variances not assumed			3.080	60.305	.003
Managerial patience	Equal variances assumed	.001	.981	3.357	141	.001
	Equal variances not assumed			3.250	74.130	.002
Active advocacy	Equal variances assumed	.906	.343	1.242	141	.216
	Equal variances not assumed			1.330	93.686	.187
Management participation in ERPS learning sessions	Equal variances assumed	1.208	.274	-.250	141	.803
	Equal variances not assumed			-.264	90.972	.792
Managerial citizenship behaviour	Equal variances assumed	.049	.825	1.299	141	.196
	Equal variances not assumed			1.294	78.967	.199
Power sharing	Equal variances assumed	2.343	.128	2.917	141	.004
	Equal variances not assumed			2.656	65.500	.010
Performance based reward policy	Equal variances assumed	.222	.638	.836	141	.404
	Equal variances not assumed			.826	77.399	.412
Usage of ERPS at departmental layer	Equal variances assumed	1.752	.188	3.321	141	.001
	Equal variances not assumed			3.074	67.635	.003

Table A.12-T-test departmental layer category

	Category	N	Mean	Std. Deviation	Std. Error Mean
Operational support	Teacher	143	3.9493	.67302	.05628
	Employee	0[a]	.	.	.
Managerial patience	Teacher	143	3.9217	.67679	.05660
	Employee	0[a]	.	.	.
Active advocacy	Teacher	143	3.9003	.65686	.05493
	Employee	0[a]	.	.	.
Management participation in ERPS learning sessions	Teacher	143	3.5647	.70506	.05896
	Employee	0[a]	.	.	.
Managerial citizenship behaviour	Teacher	143	3.6083	.69920	.05847
	Employee	0[a]	.	.	.
Power sharing	Teacher	143	3.6951	.76281	.06379
	Employee	0[a]	.	.	.
Performance based reward policy	Teacher	143	3.4867	.68157	.05700
	Employee	0[a]	.	.	.
Usage of ERPS at departmental layer	Teacher	143	3.8636	.88847	.07430
	Employee	0[a]	.	.	.

Table A.13-T-test departmental layer gender

		Levene's Test for Equality of Variances		t-test for Equality of Means		
		F	Sig.	t	df	Sig. (2-tailed)
Operational support	Equal variances assumed	2.483	.117	-1.128	141	.261
	Equal variances not assumed			-1.170	83.440	.245
Managerial patience	Equal variances assumed	1.756	.187	-.349	141	.728
	Equal variances not assumed			-.378	92.419	.707
Active advocacy	Equal variances assumed	.605	.438	-.052	141	.959
	Equal variances not assumed			-.054	84.853	.957
Management participation in ERPS learning sessions	Equal variances assumed	2.004	.159	-.398	141	.691
	Equal variances not assumed			-.429	91.349	.669
Managerial citizenship behaviour	Equal variances assumed	.052	.820	-1.306	141	.194
	Equal variances not assumed			-1.338	80.980	.185
Power sharing	Equal variances assumed	2.175	.143	-1.648	141	.102
	Equal variances not assumed			-1.817	96.648	.072
Performance based reward policy	Equal variances assumed	4.932	.028	-.796	141	.427
	Equal variances not assumed			-.903	103.850	.368
Usage of ERPS at departmental layer	Equal variances assumed	1.617	.206	-.873	141	.384
	Equal variances not assumed			-.875	77.087	.385

Table A.14-Anova departmental layer age

		Sum of Squares	df	Mean Square	F	Sig.
Operational support	Between Groups	7.055	7	1.008	2.376	.025
	Within Groups	57.264	135	.424		
	Total	64.320	142			
Managerial patience	Between Groups	10.038	7	1.434	3.519	.002
	Within Groups	55.005	135	.407		
	Total	65.043	142			
Active advocacy	Between Groups	9.100	7	1.300	3.364	.002
	Within Groups	52.167	135	.386		
	Total	61.267	142			
Management participation in ERPS learning sessions	Between Groups	2.580	7	.369	.732	.645
	Within Groups	68.009	135	.504		
	Total	70.589	142			
Managerial citizenship behaviour	Between Groups	6.117	7	.874	1.864	.080
	Within Groups	63.303	135	.469		
	Total	69.421	142			
Power sharing	Between Groups	10.201	7	1.457	2.716	.011
	Within Groups	72.426	135	.536		
	Total	82.627	142			
Performance based reward policy	Between Groups	1.538	7	.220	.460	.862
	Within Groups	64.427	135	.477		
	Total	65.965	142			
Usage of ERPS at departmental layer	Between Groups	17.672	7	2.525	3.610	.001
	Within Groups	94.419	135	.699		
	Total	112.091	142			

Table A.15-Anova departmental layer education

		Sum of Squares	df	Mean Square	F	Sig.
Operational support	Between Groups	2.377	2	1.189	2.687	.072
	Within Groups	61.943	140	.442		
	Total	64.320	142			
Managerial patience	Between Groups	3.633	2	1.816	4.141	.018
	Within Groups	61.410	140	.439		
	Total	65.043	142			
Active advocacy	Between Groups	1.301	2	.650	1.519	.223
	Within Groups	59.967	140	.428		
	Total	61.267	142			
Management participation in ERPS learning sessions	Between Groups	1.422	2	.711	1.439	.241
	Within Groups	69.167	140	.494		
	Total	70.589	142			
Managerial citizenship behaviour	Between Groups	1.375	2	.688	1.415	.246
	Within Groups	68.046	140	.486		
	Total	69.421	142			
Power sharing	Between Groups	3.572	2	1.786	3.162	.045
	Within Groups	79.055	140	.565		
	Total	82.627	142			
Performance based reward policy	Between Groups	.684	2	.342	.733	.482
	Within Groups	65.281	140	.466		
	Total	65.965	142			
Usage of ERPS at departmental layer	Between Groups	5.646	2	2.823	3.713	.027
	Within Groups	106.445	140	.760		
	Total	112.091	142			

Table A.16-Anova departmental layer total experience

		Sum of Squares	df	Mean Square	F	Sig.
Operational support	Between Groups	6.671	4	1.668	3.992	.004
	Within Groups	57.649	138	.418		
	Total	64.320	142			
Managerial patience	Between Groups	7.578	4	1.894	4.549	.002
	Within Groups	57.465	138	.416		
	Total	65.043	142			
Active advocacy	Between Groups	4.228	4	1.057	2.557	.041
	Within Groups	57.039	138	.413		
	Total	61.267	142			
Management participation in ERPS learning sessions	Between Groups	3.957	4	.989	2.049	.091
	Within Groups	66.632	138	.483		
	Total	70.589	142			
Managerial citizenship behaviour	Between Groups	4.281	4	1.070	2.268	.065
	Within Groups	65.139	138	.472		
	Total	69.421	142			
Power sharing	Between Groups	10.016	4	2.504	4.759	.001
	Within Groups	72.611	138	.526		
	Total	82.627	142			
Performance based reward policy	Between Groups	3.087	4	.772	1.694	.155
	Within Groups	62.878	138	.456		
	Total	65.965	142			
Usage of ERPS at departmental layer	Between Groups	15.909	4	3.977	5.707	.000
	Within Groups	96.181	138	.697		
	Total	112.091	142			

Table A.17-Anova departmental layer experience in HEIs

		Sum of Squares	df	Mean Square	F	Sig.
Operational support	Between Groups	10.481	4	2.620	6.716	.000
	Within Groups	53.839	138	.390		
	Total	64.320	142			
Managerial patience	Between Groups	9.713	4	2.428	6.056	.000
	Within Groups	55.330	138	.401		
	Total	65.043	142			
Active advocacy	Between Groups	7.588	4	1.897	4.877	.001
	Within Groups	53.679	138	.389		
	Total	61.267	142			
Management participation in ERPS learning sessions	Between Groups	2.709	4	.677	1.377	.245
	Within Groups	67.880	138	.492		
	Total	70.589	142			
Managerial citizenship behaviour	Between Groups	6.497	4	1.624	3.562	.008
	Within Groups	62.923	138	.456		
	Total	69.421	142			
Power sharing	Between Groups	13.646	4	3.412	6.825	.000
	Within Groups	68.981	138	.500		
	Total	82.627	142			
Performance based reward policy	Between Groups	6.262	4	1.566	3.619	.008
	Within Groups	59.702	138	.433		
	Total	65.965	142			
Usage of ERPS at departmental layer	Between Groups	17.690	4	4.422	6.465	.000
	Within Groups	94.401	138	.684		
	Total	112.091	142			

Table A.18-Anova departmental layer experience in current HEI

		Sum of Squares	df	Mean Square	F	Sig.
Operational support	Between Groups	10.026	4	2.506	6.371	.000
	Within Groups	54.294	138	.393		
	Total	64.320	142			
Managerial patience	Between Groups	8.659	4	2.165	5.299	.001
	Within Groups	56.383	138	.409		
	Total	65.043	142			
Active advocacy	Between Groups	3.183	4	.796	1.891	.116
	Within Groups	58.084	138	.421		
	Total	61.267	142			
Management participation in ERPS learning sessions	Between Groups	2.120	4	.530	1.068	.375
	Within Groups	68.469	138	.496		
	Total	70.589	142			
Managerial citizenship behaviour	Between Groups	8.456	4	2.114	4.785	.001
	Within Groups	60.965	138	.442		
	Total	69.421	142			
Power sharing	Between Groups	13.589	4	3.397	6.791	.000
	Within Groups	69.037	138	.500		
	Total	82.627	142			
Performance based reward policy	Between Groups	10.076	4	2.519	6.220	.000
	Within Groups	55.889	138	.405		
	Total	65.965	142			
Usage of ERPS at departmental layer	Between Groups	9.586	4	2.396	3.226	.014
	Within Groups	102.505	138	.743		
	Total	112.091	142			

Table A.19-Anova departmental layer experience using ERPS

		Sum of Squares	df	Mean Square	F	Sig.
Operational support	Between Groups	17.831	4	4.458	13.233	.000
	Within Groups	46.489	138	.337		
	Total	64.320	142			
Managerial patience	Between Groups	12.845	4	3.211	8.490	.000
	Within Groups	52.198	138	.378		
	Total	65.043	142			
Active advocacy	Between Groups	5.463	4	1.366	3.377	.011
	Within Groups	55.805	138	.404		
	Total	61.267	142			
Management participation in ERPS learning sessions	Between Groups	3.954	4	.988	2.047	.091
	Within Groups	66.635	138	.483		
	Total	70.589	142			
Managerial citizenship behaviour	Between Groups	11.892	4	2.973	7.132	.000
	Within Groups	57.529	138	.417		
	Total	69.421	142			
Power sharing	Between Groups	16.551	4	4.138	8.642	.000
	Within Groups	66.076	138	.479		
	Total	82.627	142			
Performance based reward policy	Between Groups	4.326	4	1.081	2.421	.051
	Within Groups	61.639	138	.447		
	Total	65.965	142			
Usage of ERPS at departmental layer	Between Groups	11.857	4	2.964	4.081	.004
	Within Groups	100.234	138	.726		
	Total	112.091	142			

Table A.20-T-test end-user layer sector

		Levene's Test for Equality of Variances		t-test for Equality of Means		
		F	Sig.	t	df	Sig. (2-tailed)
Trainings	Equal variances assumed	1.936	.164	2.359	1086	.018
	Equal variances not assumed			2.297	359.959	.022
Learning orientation	Equal variances assumed	.012	.913	-2.007	1086	.045
	Equal variances not assumed			-1.901	347.694	.058
Acceptance and usage of system	Equal variances assumed	1.157	.282	-.486	1086	.627
	Equal variances not assumed			-.460	346.953	.646
Participation and support	Equal variances assumed	1.796	.180	1.111	1086	.267
	Equal variances not assumed			1.143	388.186	.254
Resistance	Equal variances assumed	2.244	.134	-1.936	1086	.053
	Equal variances not assumed			-1.972	382.642	.049
Ease of use	Equal variances assumed	.627	.429	-.523	1086	.601
	Equal variances not assumed			-.538	388.827	.591
Usefulness	Equal variances assumed	2.485	.115	-2.127	1086	.034
	Equal variances not assumed			-2.253	405.841	.025
Usage of ERPS at end-user layer	Equal variances assumed	.400	.527	1.135	1086	.257
	Equal variances not assumed			1.159	384.132	.247

Table A.21-T-test end-user layer category

		Levene's Test for Equality of Variances		t-test for Equality of Means		
		F	Sig.	t	df	Sig. (2-tailed)
Trainings	Equal variances assumed	5.023	.025	-5.412	1086	.000
	Equal variances not assumed			-5.830	110.599	.000
Learning orientation	Equal variances assumed	3.691	.055	-2.883	1086	.004
	Equal variances not assumed			-3.765	123.787	.000
Acceptance and usage of system	Equal variances assumed	8.224	.004	1.733	1086	.083
	Equal variances not assumed			1.447	100.928	.151
Participation and support	Equal variances assumed	.316	.574	-.832	1086	.406
	Equal variances not assumed			-.841	107.560	.402
Resistance	Equal variances assumed	6.678	.010	1.526	1086	.127
	Equal variances not assumed			1.386	103.465	.169
Ease of use	Equal variances assumed	1.406	.236	2.714	1086	.007
	Equal variances not assumed			2.582	105.101	.011
Usefulness	Equal variances assumed	.159	.690	-.685	1086	.494
	Equal variances not assumed			-.660	105.608	.511
Usage of ERPS at end-user layer	Equal variances assumed	5.168	.023	-.483	1086	.630
	Equal variances not assumed			-.432	103.026	.666

Table A.22-T-test end-user layer gender

		Levene's Test for Equality of Variances		t-test for Equality of Means		
		F	Sig.	t	df	Sig. (2-tailed)
Trainings	Equal variances assumed	7.910	.005	.760	1086	.447
	Equal variances not assumed			.795	651.049	.427
Learning orientation	Equal variances assumed	4.451	.035	-.679	1086	.497
	Equal variances not assumed			-.716	664.529	.474
Acceptance and usage of system	Equal variances assumed	1.199	.274	-.923	1086	.356
	Equal variances not assumed			-.947	622.596	.344
Participation and support	Equal variances assumed	.800	.371	-1.007	1086	.314
	Equal variances not assumed			-1.017	600.943	.310
Resistance	Equal variances assumed	8.178	.004	-.313	1086	.754
	Equal variances not assumed			-.330	662.270	.741
Ease of use	Equal variances assumed	17.660	.000	-2.712	1086	.007
	Equal variances not assumed			-2.916	695.214	.004
Usefulness	Equal variances assumed	9.068	.003	-1.268	1086	.205
	Equal variances not assumed			-1.329	654.485	.184
Usage of ERPS at end-user layer	Equal variances assumed	1.369	.242	-1.722	1086	.085
	Equal variances not assumed			-1.761	618.149	.079

Table A.23-Anova end-user layer age

		Sum of Squares	df	Mean Square	F	Sig.
Trainings	Between Groups	19.424	8	2.428	2.516	.010
	Within Groups	1041.286	1079	.965		
	Total	1060.710	1087			
Learning orientation	Between Groups	26.826	8	3.353	6.583	.000
	Within Groups	549.662	1079	.509		
	Total	576.488	1087			
Acceptance and usage of system	Between Groups	23.976	8	2.997	5.489	.000
	Within Groups	589.141	1079	.546		
	Total	613.117	1087			
Participation and support	Between Groups	18.372	8	2.296	2.399	.014
	Within Groups	1032.720	1079	.957		
	Total	1051.092	1087			
Resistance	Between Groups	37.912	8	4.739	9.116	.000
	Within Groups	560.901	1079	.520		
	Total	598.813	1087			
Ease of use	Between Groups	9.299	8	1.162	1.505	.151
	Within Groups	833.268	1079	.772		
	Total	842.566	1087			
Usefulness	Between Groups	27.277	8	3.410	5.478	.000
	Within Groups	671.605	1079	.622		
	Total	698.882	1087			
Usage of ERPS at end-user layer	Between Groups	13.768	8	1.721	1.862	.062
	Within Groups	997.224	1079	.924		
	Total	1010.992	1087			

Table A.24-Anova end-user layer education

		Sum of Squares	df	Mean Square	F	Sig.
Trainings	Between Groups	6.680	5	1.336	1.372	.232
	Within Groups	1054.029	1082	.974		
	Total	1060.710	1087			
Learning orientation	Between Groups	20.232	5	4.046	7.871	.000
	Within Groups	556.256	1082	.514		
	Total	576.488	1087			
Acceptance and usage of system	Between Groups	38.655	5	7.731	14.562	.000
	Within Groups	574.461	1082	.531		
	Total	613.117	1087			
Participation and support	Between Groups	6.497	5	1.299	1.346	.242
	Within Groups	1044.595	1082	.965		
	Total	1051.092	1087			
Resistance	Between Groups	42.131	5	8.426	16.378	.000
	Within Groups	556.682	1082	.514		
	Total	598.813	1087			
Ease of use	Between Groups	12.206	5	2.441	3.181	.007
	Within Groups	830.360	1082	.767		
	Total	842.566	1087			
Usefulness	Between Groups	33.673	5	6.735	10.954	.000
	Within Groups	665.210	1082	.615		
	Total	698.882	1087			
Usage of ERPS at end-user layer	Between Groups	10.344	5	2.069	2.237	.049
	Within Groups	1000.648	1082	.925		
	Total	1010.992	1087			

Table A.25-Anova end-user layer total experience

		Sum of Squares	df	Mean Square	F	Sig.
Trainings	Between Groups	34.994	4	8.748	9.237	.000
	Within Groups	1025.716	1083	.947		
	Total	1060.710	1087			
Learning orientation	Between Groups	6.255	4	1.564	2.970	.019
	Within Groups	570.233	1083	.527		
	Total	576.488	1087			
Acceptance and usage of system	Between Groups	5.824	4	1.456	2.597	.035
	Within Groups	607.292	1083	.561		
	Total	613.117	1087			
Participation and support	Between Groups	2.519	4	.630	.650	.627
	Within Groups	1048.573	1083	.968		
	Total	1051.092	1087			
Resistance	Between Groups	9.674	4	2.419	4.446	.001
	Within Groups	589.139	1083	.544		
	Total	598.813	1087			
Ease of use	Between Groups	.227	4	.057	.073	.990
	Within Groups	842.340	1083	.778		
	Total	842.566	1087			
Usefulness	Between Groups	3.723	4	.931	1.450	.215
	Within Groups	695.159	1083	.642		
	Total	698.882	1087			
Usage of ERPS at end-user layer	Between Groups	4.320	4	1.080	1.162	.326
	Within Groups	1006.672	1083	.930		
	Total	1010.992	1087			

Table A.26-Anova end-user layer experience in HEIs

		Sum of Squares	df	Mean Square	F	Sig.
Trainings	Between Groups	39.754	4	9.939	10.543	.000
	Within Groups	1020.956	1083	.943		
	Total	1060.710	1087			
Learning orientation	Between Groups	4.126	4	1.031	1.952	.100
	Within Groups	572.362	1083	.528		
	Total	576.488	1087			
Acceptance and usage of system	Between Groups	5.109	4	1.277	2.275	.059
	Within Groups	608.007	1083	.561		
	Total	613.117	1087			
Participation and support	Between Groups	4.537	4	1.134	1.174	.321
	Within Groups	1046.554	1083	.966		
	Total	1051.092	1087			
Resistance	Between Groups	5.267	4	1.317	2.402	.048
	Within Groups	593.546	1083	.548		
	Total	598.813	1087			
Ease of Use	Between Groups	4.834	4	1.209	1.562	.182
	Within Groups	837.732	1083	.774		
	Total	842.566	1087			
Usefulness	Between Groups	1.823	4	.456	.708	.586
	Within Groups	697.059	1083	.644		
	Total	698.882	1087			
Usage of ERPS at end-user layer	Between Groups	3.813	4	.953	1.025	.393
	Within Groups	1007.178	1083	.930		
	Total	1010.992	1087			

Table A.27-Anova end-user layer experience in current HEI

		Sum of Squares	df	Mean Square	F	Sig.
Trainings	Between Groups	43.772	4	10.943	11.654	.000
	Within Groups	1016.937	1083	.939		
	Total	1060.710	1087			
Learning orientation	Between Groups	2.305	4	.576	1.087	.362
	Within Groups	574.183	1083	.530		
	Total	576.488	1087			
Acceptance and usage of system	Between Groups	1.606	4	.402	.711	.584
	Within Groups	611.511	1083	.565		
	Total	613.117	1087			
Participation and support	Between Groups	9.649	4	2.412	2.508	.040
	Within Groups	1041.443	1083	.962		
	Total	1051.092	1087			
Resistance	Between Groups	1.382	4	.345	.626	.644
	Within Groups	597.431	1083	.552		
	Total	598.813	1087			
Ease of use	Between Groups	7.303	4	1.826	2.367	.051
	Within Groups	835.264	1083	.771		
	Total	842.566	1087			
Usefulness	Between Groups	1.995	4	.499	.775	.541
	Within Groups	696.887	1083	.643		
	Total	698.882	1087			
Usage of ERPS at end-user layer	Between Groups	5.039	4	1.260	1.356	.247
	Within Groups	1005.952	1083	.929		
	Total	1010.992	1087			

Table A.28-Anova end-user layer experience using ERPS

		Sum of Squares	df	Mean Square	F	Sig.
Trainings	Between Groups	20.947	4	5.237	5.455	.000
	Within Groups	1039.763	1083	.960		
	Total	1060.710	1087			
Learning orientation	Between Groups	27.657	4	6.914	13.644	.000
	Within Groups	548.831	1083	.507		
	Total	576.488	1087			
Acceptance and usage of system	Between Groups	34.422	4	8.605	16.105	.000
	Within Groups	578.695	1083	.534		
	Total	613.117	1087			
Participation and support	Between Groups	4.617	4	1.154	1.195	.311
	Within Groups	1046.474	1083	.966		
	Total	1051.092	1087			
Resistance	Between Groups	37.157	4	9.289	17.912	.000
	Within Groups	561.656	1083	.519		
	Total	598.813	1087			
Ease of use	Between Groups	4.715	4	1.179	1.524	.193
	Within Groups	837.851	1083	.774		
	Total	842.566	1087			
Usefulness	Between Groups	20.618	4	5.154	8.230	.000
	Within Groups	678.265	1083	.626		
	Total	698.882	1087			
Usage of ERPS at end-user layer	Between Groups	2.508	4	.627	.673	.610
	Within Groups	1008.483	1083	.931		
	Total	1010.992	1087			

Appendix B-Figures

UNIVERSITY OF THE PUNJAB

Quaid-i-Azam Campus, Lahore - Pakistan
Tele : Off. 042-99231102
Fax : 042-99231103
E-Mail : registrar@pup.edu.pk

University of the Punjab
No. D/ 59 /Est-I
Dated 07-01-14

Mr. Zeshan Ahmer,
Lecturer,
Institute of Business Administration,
University of the Punjab,
Quaid-e-Azam Campus,
Lahore.

Subject: **PERMISSION TO CONDUCT RESEARCH IN UNIVERSITY OF THE PUNJAB.**

Please refer to your application No D/11/B.Admin dated 06.01.2014, on the subject cited above.

The Vice-Chancellor has been pleased to allow you to conduct a survey for your research on "Diffusion of Campus Management System (CMS) in Higher Education Institutions of Pakistan", subject to the condition that the data collected by your goodself shall remain confidential and the respondent's anonymity will be respected. In addition, the respondents have the right to withdraw their consent to participate in the study at any stage of the research.

7/1/14

(NAVEED-UR-REHMAN)
Deputy Registrar(Admin-I)
For Registrar

Figure B.1-Permission for data collection from University of the Punjab Lahore

The Islamia University of Bahawalpur
Directorate of Advanced Studies & Research
Abbasia Campus, Ph # 062-9250247

No. 1006/AS&RB
02 / 07 / 2014

Mr. Zeshan Ahmer,
Lecture, Institute of business Administration,
University of the Punjab,
Quaid-e-Azam Campus, Lahore
0321-9474023

Subject: **Permission to Conduct Research Work in the Islamia University of Bahawalpur**

Respected Sir,

1. Please refer to your application 489/B.Admn dated 26th May, 2014 on the subject mentioned above.

2. The Vice-Chancellor has been pleased to allow you to conduct a survey for your research on "Diffusion of Enterprise Resources Planning Systems: A Case Study of Higher Education Institutions in Pakistan" conditionally that the data collected by your goodself shall remain confidential and the respondent's anonymity will be respected.

3. In addition, the respondents have the right to withdraw their consent to participate in the study at any stage of the research.

M. Ahmad
Assistant Registrar (AS&R)
for Director (AS&RB)

Figure B.2-Permission for data collection from Islamia University Bahawalpur

Bahria University
Shangrila Road
Sector E-8
ISLAMABAD
Ph: 051-9260002 Ext: 223

BU-ORIC/2014/441

Mr. Zeshan Ahmer
Lecturer – Institute of Business Administration (IBA)
University of the Punjab,
Quaid-e-Azam Campus,
Lahore – 54590.

7 November, 2014

PERMISSION TO CONDUCT RESEARCH AT BAHRIA UNIVERSITY

Reference:

A. IBA Letter No. 913/B.Admin dated 25th September, 2014

1. This is with reference to the aforementioned letter regarding the request for permission to conduct research study at Bahria University (BU).

2. I am pleased to inform that Bahria University has acceded to your request for conducting a research based survey on "Usage of Enterprise Resource Planning Systems in Higher Education Institutions of Pakistan" subject to the condition that the data collected by your goodself shall remain confidential and the respondent's anonymity will be respected. In addition, the respondents have the right to withdraw their consent to participate in the study at any stage of the research.

3. The University would also like to receive a report on the outcome of the research with suggestions to improve upon the existing usage of ERP in an efficient manner.

4. You are requested to coordinate with Director MIS, Bahria University for modalities of data collection on the said MIS related research topic.

SHAHID SAEED HI(M)
Rear Admiral
Registrar

For Info:
Director MIS - BU
Director ORIC - BU

Figure B.3-Permission for data collection from Bahria University Islamabad

Appendix C-Hypotheses Accepted

Organisational layer

Below is a list of the hypotheses developed at the organisational layer:

Hypothesis Org1: Expert human resource availability will positively influence usage of ERPS at the organisational layer.

Hypothesis Org2: High tolerance for risks and conflicts will positively affect usage of ERPS at the organisational layer.

Hypothesis Org3: High collegial support and collaboration will positively influence usage of ERPS at the organisational layer.

Hypothesis Org4: Rational decision making and control will have positive impact on usage of ERPS at the organisational layer

Departmental layer

Below is a list of the hypotheses developed at the departmental layer:

Hypothesis Dep1: High operational support will positively influence usage of ERPS at the departmental layer.

Hypothesis Dep2: High managerial patience will have a positive impact on usage of ERPS at the departmental layer.

Hypothesis Dep3: Active advocacy for ERPS will positively affect usage of ERPS at the departmental layer.

Hypothesis Dep4: Management participation in ERPS learning sessions will positively affect usage of ERPS at the departmental layer.

Hypothesis Dep5: Management citizenship behaviour will have a positive influence on the usage of ERPS at the departmental layer.

Hypothesis Dep6: Power sharing will have a positive impact on usage of ERPS at the departmental layer.

Hypothesis Dep7: Performance based reward policy for ERPS usage will positively influence usage of ERPS at the departmental layer.

End-user layer

Below is a list of the hypotheses developed at the organisational layer:

Hypothesis Eu1: ERPS training will positively influence usage of ERPS at the end-user layer.

Hypothesis Eu2: Learning orientation will positively affect the usage of ERPS at the end-user layer.

Hypothesis Eu3: High acceptance and usage of the system will positively affect usage of ERPS at the end-user layer.

Hypothesis Eu4: High Participation and support will positively influence usage of ERPS at the end-user layer.

Hypothesis Eu5: High resistance will negatively affect usage of ERPS at the end-user layer.

Hypothesis Eu6: High ease of use will positively influence usage of ERPS at the end-user layer.

Hypothesis Eu7: Perceived usefulness and user satisfaction will have a positive impact on usage of ERPS at the end-user layer.

Appendix D-Questionnaires used for pilot study

Organisational layer (Q-Org)

HE01-O ?

USAGE OF ENTERPRISE RESOURCE PLANNING SYSTEMS IN HIGHER EDUCATION INSTITUTIONS IN PAKISTAN

Agreement to Participate In the Research

Introduction

This questionnaire is designed to implement a research program to analyse the usage of the Enterprise Resource Planning Systems (ERPS) deployed and currently functional in Higher Education Institutions (HEIs) of Pakistan. This system contains multiple functions, which serves as a link for various teaching faculty and administration staff to perform their activities within the computing based environment. This survey is about your experience with the software as being part of this University.

This questionnaire will take approximately 18 minutes. Your time and effort will be highly appreciated.

Please give your consent to the following and sign below:

☐ **Purpose of Research**
I understand the purpose of research (explained above).

☐ **Research Voluntary Participation**
I have been assured that I am participating in this research with my free consent and I may withdraw from the study at any time without disadvantage or have to give a reason.

☐ **Anonymity**
This is purely an academic research and data collected from this study will be used only for research purpose and within the ethical guidelines of University of Hertfordshire (UK). The answers and information will remain confidential and anonymous. My name (or my department name) will not be made in any type of write-up of this research.

☐ **Information Handling**
I understand that the information I share in this questionnaire about my experience and opinion of ERPS will be kept at a secure place. The questionnaire data will be used in statistical software for analysis and then become a part of PhD dissertation. Only the researcher and supervisors will have access to this data.

☐ **Risks**
I have been assured that there are no specific risks associated with my participation in this research.

☐ **Health Issues**
I have been told what although this research does not seek information about my personal health condition. However, if I wish, I can withdraw from my participation at any stage.

☐ **Future contact**
I have been told that I may at some time in the future be contacted again in connection with this or another study.

Signature of Participant ……………………………………… Date………………………….

Researcher: **Zeshan Ahmer** (Signature) ………………………………………

Lecturer, Institute of Business Administration, University of the Punjab, Lahore &

PhD Student, Business School, University of Hertfordshire, United Kingdom.

If you have any queries, please feel free to contact at 0321-9474023 or z.ahmer@herts.ac.uk & zeshan@ibapu.edu.pk

For each question given below, please tick [✔] one option that best represents your answer.

DEMOGRAPHICS

Gender: Male [ ] Female [ ]

Age Group (Years) : 21-25 [ ] 26-30 [ ] 31-35 [ ] 36-40 [ ] 41-45 [ ]
46-50 [ ] 51-55 [ ] 56-60 [ ] Above 60 [ ]

Highest Education Achieved: PhD [ ] MPhil [ ] Masters [ ] Bachelors [ ]

Total Work Experience (Years): 0-5 [ ] 6-10 [ ] 11-15 [ ] 16-20 [ ] Above 20 [ ]

Total Experience in Universities (Years): 0-5 [ ] 6-10 [ ] 11-15 [ ] 16-20 [ ] Above 20 [ ]

Experience in Current University(Years): 0-5 [ ] 6-10 [ ] 11-15 [ ] 16-20 [ ] Above 20 [ ]

Experience Dealing with ERPS (Years): < 1 [ ] < 2 [ ] < 3 [ ] < 4 [ ] Above 4 [ ]

Designation: ________________________________

For each question given below, please tick [✔] one option that best represents your answer.

Org1	**UNIVERSITY CULTURE FOR ERPS**					
1.1	ERPS is customised in accordance with culture of the university	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1.2	ERPS is capable of meeting the official needs of its users	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1.3	University supports culture for learning of ERPS	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1.4	Regarding ERPS, Power sharing is encouraged in the university	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1.5	University politics affects the performance of employees concerned with ERPS	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1.6	Tasks related to ERPS are kept pending due to the effect of university politics	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Org2	**HUMAN RESOURCE AVAILABILITY FOR ERPS**					
2.1	In this university, there is a dedicated technical team to support the users of ERPS	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
2.2	In this university, the technical team of ERPS is able to solve problems of ERPS users	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

2.3	ERPS users give positive feedback about expertise of ERPS technical team	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
2.4	Based on negative feedback from ERPS users, refined strategy is implemented to improve efficiency of ERPS technical team	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
2.5	When refined ERPS strategy is implemented, it produces positive results	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
2.6	In this University, the colleges/institutes/departments/cells have adequate ERPS skilled employees	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Org3	**TOLERANCE FOR RISKS AND CONFLICTS FOR ERPS**					
3.1	Top management has taken actions to enhance usage of ERPS	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
3.2	Positive outcomes are reported of actions of top management	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
3.3	Top management has shown tolerance to negative effects of actions taken by them	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
3.4	The university has clear policy regarding conflict resolution among different administrative offices	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
3.5	In case of any conflict among IT office and any other office, University is able to resolve the conflict well	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
3.6	The university has shown tolerance in case of worst conflicts regarding ERPS	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Org4	**COLLEGIAL SUPPORT AND COLLABORATION**					
4.1	The university takes measures to support users of ERPS for its extended use	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
4.2	Measures taken to support users of ERPS contributed significantly towards its usage	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
4.3	The university entities have strong collaboration regarding ERPS activities	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
4.4	Strong collaboration among top management officials and departments have increased ERPS usage across university	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Org5	**DECISION MAKING AND CONTROL**					
5.1	Stakeholders are involved in decision-making processes regarding ERPS	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
5.2	Administrative control is better achieved through ERPS	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
5.3	The implemented system helps in the process of decision making	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
5.4	Response of users to using ERPS is being resistant	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

5.5	Steps are taken to remove resistance of users to using ERPS	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
5.6	Steps taken are successful in handling resistance of ERPS users	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
5.7	Feedback received from users about ERPS is positive	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
5.8	Steps are taken to increase percentage usage of ERPS	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
5.9	Steps taken have produced good results regarding usage of ERPS	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Org6	**ORGANISATIONAL ALIGNMENT OF ERPS**					
6.1	ERPS implemented was aligned with the organisational objectives	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
6.2	University has suggested any further changes improve alignment of ERPS with organisational objectives	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
6.3	ERPS in current form in university is fully aligned with the organisational objectives	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
6.4	ERPS is meeting the current requirements of university	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Org7	**TRAINING TO USE ERPS**					
7.1	University provided necessary training programs to the users of ERPS	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
7.2	Training provided to users was adequate to meet the requirements of users of ERPS	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
7.3	University felt that there was resistance in attending training of ERPS	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
7.4	Training provided to users of ERPS produced clear positive results regarding usage of ERPS	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
7.5	Feedback of users was satisfactory regarding training of ERPS provided by the university	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
7.6	University feels that more training for users of ERPS is required	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
7.7	More training to users of ERPS will increase usage of ERPS	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

Org8	**BENEFITS REALISATION**					
8.1	ERPS has provided the anticipated overall benefits in reality	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
8.2	ERPS has increased productivity of institutes/colleges/departments/centers	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
8.3	ERPS has increased task completion efficiency	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
8.4	ERPS has reduced overall operational cost as compared to manual working	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
8.5	Error percentage in overall processes has reduced due to ERPS	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
8.6	ERPS provides information throughout organisation required on as, when and where basis	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Org9	**SETTING UP LEARNING STRUCTURE FOR ERPS**					
9.1	University has to incorporate innovative changes in process of ERPS implementation	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
9.2	University has successfully adapted to the changes required in using ERPS	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
9.3	University has considered itself to be up to the mark in challenges posted by ERPS	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
9.4	University has taken steps to promote learning environment to cater to the needs of ERPS	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
9.5	Steps taken to promote learning environments have produced positive results regarding ERPS usage	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Org10	**USAGE OF ERPS**					
10.1	ERPS usage is at satisfactory level in the University	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

Thank you for your participation and time

Departmental layer (Q-Dep)

HE01-D ?

USAGE OF ENTERPRISE RESOURCE PLANNING SYSTEMS IN HIGHER EDUCATION INSTITUTIONS IN PAKISTAN

Agreement to Participate In the Research

Introduction

This questionnaire is designed to implement a research program to analyse the usage of the Enterprise Resource Planning Systems (ERPS) deployed and currently functional in Higher Education Institutions (HEIs) of Pakistan. This system contains multiple functions, which serves as a link for various teaching faculty and administration staff to perform their activities within the computing based environment. This survey is about your experience with the software as being part of this University.

This questionnaire will take approximately 15 minutes. Your time and effort will be highly appreciated.

Please give your consent to the following and sign below:

☐ **Purpose of Research**
I understand the purpose of research (explained above).

☐ **Research Voluntary Participation**
I have been assured that I am participating in this research with my free consent and I may withdraw from the study at any time without disadvantage or have to give a reason.

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☐ **Risks**
I have been assured that there are no specific risks associated with my participation in this research.

☐ **Health Issues**
I have been told what although this research does not seek information about my personal health condition. However, if I wish, I can withdraw from my participation at any stage.

☐ **Future contact**
I have been told that I may at some time in the future be contacted again in connection with this or another study.

Signature of Participant ……………………………………… Date………………………….

Researcher: **Zeshan Ahmer** (Signature) ………………………………………

Lecturer, Institute of Business Administration, University of the Punjab, Lahore &

PhD Student, Business School, University of Hertfordshire, United Kingdom.

If you have any queries, please feel free to contact at 0321-9474023 or z.ahmer@herts.ac.uk & zeshan@ibapu.edu.pk

For each question given below, please tick [✔] one option that best represents your answer.

Demographics:

Gender: Male ☐ Female ☐

Age Group (Years) : 21-25 ☐ 26-30 ☐ 31-35 ☐ 36-40 ☐ 41-45 ☐ 46-50 ☐ 51-55 ☐ 56-60 ☐ Above 60 ☐

Highest Education Achieved: PhD ☐ MPhil ☐ Masters ☐ Bachelors ☐

Total Work Experience (Years): 0-5 ☐ 6-10 ☐ 11-15 ☐ 16-20 ☐ Above 20 ☐

Total Experience in Universities (Years): 0-5 ☐ 6-10 ☐ 11-15 ☐ 16-20 ☐ Above 20 ☐

Experience in Current University(Years): 0-5 ☐ 6-10 ☐ 11-15 ☐ 16-20 ☐ Above 20 ☐

Experience Supervising ERPS as Head of Institution/Department/College (Years): < 1 ☐ < 2 ☐ < 3 ☐ < 4 ☐ Above 4 ☐

For each question given below, please tick [✔] one option that best represents your answer.

Dep1	**OPERATIONAL SUPPORT**					
1.1	The users of ERPS are provided with adequate facilities to enhance usage of ERPS	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1.2	The users of ERPS are facilitated in terms of required operational support	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1.3	Management is being helpful in removing hurdles in ERPS usage	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1.4	Management is eager to provide any support that is demanded by staff to enhance ERPS usage	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Dep2	**MANAGERIAL PATIENCE**					
2.1	ERPS users have cooperative behaviour towards ERPS	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
2.2	If users of ERPS resist using the software, then the management tackles it well	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
2.3	Management is committed to increasing the usage of ERPS	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
2.4	Management has taken measures to motivate staff to increase the usage of ERPS	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
2.5	ERPS usage in department has increased due to the motivational measures were taken by the management	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

Dep3	ACTIVE ADVOCACY					
3.1	Management actively promotes importance of ERPS usage	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
3.2	Management actively stimulates staff to be pro-active in ERPS usage	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
3.3	Staff is actually encouraged by the management to use ERPS	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
3.4	Management active advocacy to increase ERPS usage has improved ERPS usage	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Dep4	**MANAGEMENT PARTICIPATION IN ERPS LEARNING SESSIONS**					
4.1	Management officials participate in ERPS training sessions	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
4.2	Managerial participation in ERPS training sessions positively impacts users of ERPS	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
4.3	Attendance of staff in ERPS training session improves due to managerial participation in ERPS training sessions	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
4.4	Attendance of staff in ERPS training session is not affected due to managerial non-participation in ERPS training sessions	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Dep5	**MANAGERIAL CITIZENSHIP BEHAVIOUR**					
5.1	Management is using its discretionary powers to increase ERPS usage	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
5.2	Discretionary role of management has produced positive results regarding ERPS usage	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
5.3	Management inputs extra efforts to enhance usage of ERPS	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
5.4	Extra efforts put in by management are found to be a key to enhanced ERPS usage	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
5.5	Management happily works for extra hours to increase the usage of ERPS	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
5.6	Management working extra hours inspires staff to happily work for long hours to achieve ERPS usage targets set by management	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Dep6	**POWER SHARING**					
6.1	Management delegates authority to staff regarding decision making of ERPS	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
6.2	Management trusts on capabilities of staff in context of ERPS	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
6.3	Management feels that power sharing is an important tool in increasing usage of ERPS	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

6.4	Power sharing with staff has motivated them to contribute positively to usage of ERPS	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
6.5	Power sharing has positively influenced the usage of ERPS	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Dep7	**PERFORMANCE BASED REWARD POLICY**					
7.1	Management encourages staff to maximise performance of ERPS usage	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
7.2	The performance of ERPS usage is measured by management	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
7.3	Financial rewards are awarded to motivate staff based on efficient performance regarding ERPS usage	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
7.4	Staff showing ERPS performance commitment are awarded monetary rewards	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
7.5	Performance based reward policy positively impacts ERPS usage	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Dep8	**USAGE OF ERPS AT THE DEPARTMENTAL LAYER**					
8.1	ERPS usage in this institute/department/college is at satisfactory level	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

Thank you for your participation

End-user layer (Q-Eu)

HE01-D -E ?

USAGE OF ENTERPRISE RESOURCE PLANNING SYSTEMS IN HIGHER EDUCATION INSTITUTIONS IN PAKISTAN

Agreement to Participate In the Research

Introduction

This questionnaire is designed to implement a research program to analyse the usage of the Enterprise Resource Planning Systems (ERPS) deployed and currently functional in Higher Education Institutions (HEIs) of Pakistan. This system contains multiple functions, which serves as a link for various teaching faculty and administration staff to perform their activities within the computing based environment. This survey is about your experience with the software as being part of this University.
This questionnaire will take approximately 20 minutes. Your time and effort will be highly appreciated.

Please give your consent to the following and sign below:

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☐ **Research Voluntary Participation**
I have been assured that I am participating in this research with my free consent and I may withdraw from the study at any time without disadvantage or have to give a reason.

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I understand that the information I share in this questionnaire about my experience and opinion of ERPS will be kept at a secure place. The questionnaire data will be used in statistical software for analysis and then become a part of PhD dissertation. Only the researcher and supervisors will have access to this data.

☐ **Risks**
I have been assured that there are no specific risks associated with my participation in this research.

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I have been told what although this research does not seek information about my personal health condition. However, if I wish, I can withdraw from my participation at any stage.

☐ **Future contact**
I have been told that I may at some time in the future be contacted again in connection with this or another study.

Signature of Participant ……………………………………… Date………………………….

Researcher: **Zeshan Ahmer** (Signature) ………………………………………

Lecturer, Institute of Business Administration, University of the Punjab, Lahore &

PhD Student, Business School, University of Hertfordshire, United Kingdom.

If you have any queries, please feel free to contact at 0321-9474023 or z.ahmer@herts.ac.uk & zeshan@ibapu.edu.pk

For each question given below, please tick [✔] one option that best represents your answer.

Demographics:

Gender: Male ☐ Female ☐

Age Group (Years) : 18-25 ☐ 26-30 ☐ 31-35 ☐ 36-40 ☐ 41-45 ☐ 46-50 ☐
51-55 ☐ 56-60 ☐ Above 60 ☐

Highest Education Achieved: PhD ☐ MPhil ☐ Masters ☐ Bachelors ☐
Intermediate ☐ Matriculation ☐ Under Matriculation ☐

Number of Years in Employment: 0-5 ☐ 6-10 ☐ 11-15 ☐ 16-20 ☐ Above 20 ☐

Experience in Universities (Years): 0-5 ☐ 6-10 ☐ 11-15 ☐ 16-20 ☐ Above 20 ☐

Experience in Current University (Years): 0-5 ☐ 6-10 ☐ 11-15 ☐ 16-20 ☐ Above 20 ☐

Experience as ERPS User (Years): < 1 ☐ < 2 ☐ < 3 ☐ < 4 ☐ Above 4 ☐

Designation: ______________________________

For each question given below, please tick [✔] one option that best represents your answer.

Eu1	**TRAINING**					
1.1	University has arranged ERPS training for staff	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1.2	I have attended the ERPS training sessions arranged by the university	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1.3	Management has motivated me to attend ERPS training sessions	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1.4	I feel comfortable with ERPS usage after attending training sessions arranged by the university	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1.5	In training provided by university, training staff was considered technically sound	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1.6	I was asked to give feedback on training sessions arranged by the university	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1.7	I did notice improvement in training sessions conducted after feedback I gave	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1.8	I feel that there is no need for further training now for ERPS	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

Eu2	**LEARNING ORIENTATION**					
2.1	I feel self-motivated to learn new things	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
2.2	I feel positively oriented towards learning ERPS	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
2.3	I want to improve my abilities through self-learning	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
2.4	I take interest in learning ERPS without pressure from the management	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
2.5	I am self-motivated to achieve efficiency in the completion of my tasks using ERPS	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Eu3	**BEHAVIOURAL INTENTIONS**					
3.1	I am ready to accept the challenges posed by ERPS	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
3.2	I intend to use ERPS to be more efficient	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
3.3	I plan to spend more time on ERPS usage	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
3.4	I plan to work harder on ERPS because I will get appreciation from the management	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Eu4	**ACCEPTANCE AND USAGE OF SYSTEM**					
4.1	I have accepted that I have to use ERPS for my tasks completion	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
4.2	I use ERPS on regular basis to complete my official tasks	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
4.3	I feel comfortable while using ERPS to complete my routine tasks	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Eu5	**PARTICIPATION AND SUPPORT**					
5.1	I was provided ERPS awareness prior to its implementation	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
5.2	I was asked to participate in implementation process of ERPS	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
5.3	Management allows me to take part in the decision making relevant to my ERPS work	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
5.4	I am respected on any immediate decisions taken regarding ERPS without involvement of the management	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
5.5	I was psychologically ready to accept ERPS	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
5.6	I did not find it difficult to adjust with ERPS	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

Eu6	**RESISTANCE**					
6.1	I did resist the usage of ERPS	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
6.2	I was not ready to accept the change from manual to automatic system	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
6.3	I resisted leaving the traditional system	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
6.4	I do use ERPS and traditional system side by side	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Eu7	**EASE OF USE**					
7.1	In my opinion, ERPS is user-friendly	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
7.2	I find ERPS easy to use	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
7.3	ERPS provides interface that is easy to understand and operate	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
7.4	I feel working with ERPS to complete my tasks is easier than working manually	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Eu8	**USEFULNESS**					
8.1	Using ERPS has enabled me to complete tasks more efficiently than before	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
8.2	ERPS has increased my performance at university	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
8.3	ERPS has enabled me to perform my work more effectively than before	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Eu9	**MOTIVATION**					
9.1	I feel motivated to use ERPS to complete my tasks	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
9.2	Management takes measures to motivate employees regarding ERPS usage	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
9.3	I happily complete ERPS assignments assigned by management	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
9.4	I set self-goals to achieve efficiency regarding ERPS tasks	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
9.5	Personal motivation helps me to achieve ERPS goals	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Eu10	**USER SATISFACTION**					
10.1	I feel satisfied with ERPS performance	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

10.2	ERPS is a useful system	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
10.3	I have found ERPS very helpful in completing day to day tasks	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
10.4	ERPS in usage is as per requirements of users to complete their tasks efficiently and effectively	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
10.5	ERPS should be implemented in all universities of Pakistan	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Eu11	**USAGE OF ERPS AT THE END-USER LAYER**					
11.1	In my opinion, overall ERPS usage is at satisfactory level	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

Thank you for your participation

Appendix E-Questionnaires used for final study

Organisational layer (Q-Org)

HE01-O ?

USAGE OF ENTERPRISE RESOURCE PLANNING SYSTEMS IN HIGHER EDUCATION INSTITUTIONS IN PAKISTAN

Agreement to Participate In the Research

Introduction

This questionnaire is designed to implement a research program to analyse the usage of the Enterprise Resource Planning Systems (ERPS) deployed and currently functional in Higher Education Institutions (HEIs) of Pakistan. This system contains multiple functions, which serves as a link for various teaching faculty and administration staff to perform their activities within the computing based environment. This survey is about your experience with the software as being part of this University.

This questionnaire will take approximately 18 minutes. Your time and effort will be highly appreciated.
Please give your consent to the following:

☐ **Purpose of Research**
I understand the purpose of research (explained above).

☐ **Research Voluntary Participation**
I have been assured that I am participating in this research with my free consent and I may withdraw from the study at any time without disadvantage or have to give a reason.

☐ **Anonymity**
This is purely an academic research and data collected from this study will be used only for research purpose and within the ethical guidelines of University of Hertfordshire (UK). The answers and information will remain confidential and anonymous. My name (or my department name) will not be made in any type of write-up of this research.

☐ **Information Handling**
I understand that the information I share in this questionnaire about my experience and opinion of ERPS will be kept at a secure place. The questionnaire data will be used in statistical software for analysis and then become a part of PhD dissertation. Only the researcher and supervisors will have access to this data.

☐ **Risks**
I have been assured that there are no specific risks associated with my participation in this research.

☐ **Health Issues**
I have been told what although this research does not seek information about my personal health condition. However, if I wish, I can withdraw from my participation at any stage.

☐ **Future contact**
I have been told that I may at some time in the future be contacted again in connection with this or another study.

Researcher: **Zeshan Ahmer** (Signature) ……………………………………… Date………………………….

Lecturer, Institute of Business Administration, University of the Punjab, Lahore &
PhD Student, Business School, University of Hertfordshire, United Kingdom.

If you have any queries, please feel free to contact at 0321-9474023 or z.ahmer@herts.ac.uk & zeshan@ibapu.edu.pk

Please tick [✔] in the box that best represents your answer

DEMOGRAPHICS

Gender: Male ☐ Female ☐

Age Group (Years) : 21-25 ☐ 26-30 ☐ 31-35 ☐ 36-40 ☐ 41-45 ☐ 46-50 ☐ 51-55 ☐ 56-60 ☐ Above 60 ☐

Highest Education Achieved: PhD ☐ MPhil ☐ Masters ☐ Bachelors ☐

Total Work Experience (Years): 0-5 ☐ 6-10 ☐ 11-15 ☐ 16-20 ☐ Above 20 ☐

Total Experience in Universities (Years): 0-5 ☐ 6-10 ☐ 11-15 ☐ 16-20 ☐ Above 20 ☐

Experience in Current University(Years): 0-5 ☐ 6-10 ☐ 11-15 ☐ 16-20 ☐ Above 20 ☐

Experience Dealing with ERPS (Years): < 1 ☐ < 2 ☐ < 3 ☐ < 4 ☐ Above 4 ☐

Org1	**UNIVERSITY CULTURE FOR ERPS**					
1.1	ERPS is customised in accordance with culture of the university	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1.2	ERPS is capable of meeting the official needs of its users	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1.3	University supports culture for learning of ERPS	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1.4	Regarding ERPS, Power sharing is encouraged in the university	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1.5	University politics affects the performance of employees concerned with ERPS	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1.6	Tasks related to ERPS are kept pending due to the effect of university politics	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Org2	**HUMAN RESOURCE AVAILABILITY FOR ERPS**					
2.1	In this university, there is a dedicated technical team to support the users of ERPS	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
2.2	In this university, the technical team of ERPS is able to solve problems of ERPS users	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
2.3	ERPS users give positive feedback about expertise of ERPS technical team	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
2.4	Based on negative feedback from ERPS users, refined strategy is implemented to improve efficiency of ERPS technical team	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
2.5	When refined ERPS strategy is implemented, it produces positive results	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
2.6	In this University, the colleges/institutes/departments/cells have adequate ERPS skilled employees	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Org3	**TOLERANCE FOR RISKS AND CONFLICTS FOR ERPS**					
3.1	Top management has taken actions to enhance usage of ERPS	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
3.2	Positive outcomes are reported of actions of top management	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
3.3	Top management has shown tolerance to negative effects of actions taken by them	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
3.4	The university has clear policy regarding conflict resolution among different administrative offices	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
3.5	In case of any conflict among IT office and any other office, University is able to resolve the conflict well	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

3.6	The university has shown tolerance in case of worst conflicts regarding ERPS	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Org4	**COLLEGIAL SUPPORT AND COLLABORATION**					
4.1	The university takes measures to support users of ERPS for its extended use	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
4.2	Measures taken to support users of ERPS contributed significantly towards its usage	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
4.3	The university entities have strong collaboration regarding ERPS activities	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
4.4	Strong collaboration among top management officials and departments have increased ERPS usage across university	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Org5	**DECISION MAKING AND CONTROL**					
5.1	Stakeholders are involved in decision-making processes regarding ERPS	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
5.2	Administrative control is better achieved through ERPS	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
5.3	The implemented system helps in the process of decision making	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
5.4	Steps are taken to remove resistance of users to using ERPS	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
`5.5	Steps taken are successful in handling resistance of ERPS users	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
5.6	Feedback received from users about ERPS is positive	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
5.7	Steps are taken to increase percentage usage of ERPS	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
5.8	Steps taken have produced good results regarding usage of ERPS	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Org6	**ORGANISATIONAL ALIGNMENT OF ERPS**					
6.1	ERPS implemented was aligned with the organisational objectives	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
6.2	ERPS in current form in university is fully aligned with the organisational objectives	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
6.3	ERPS is meeting the current requirements of university	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Org7	**TRAINING TO USE ERPS**					
7.1	University provided necessary training programs to the users of ERPS	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
7.2	Training provided to users was adequate to meet the requirements of users of ERPS	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
7.3	Training provided to users of ERPS produced clear positive results regarding usage of ERPS	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
7.4	Feedback of users was satisfactory regarding training of ERPS provided by the university	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
7.5	University feels that more training for users of ERPS is required	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
7.6	More training to users of ERPS will increase usage of ERPS					
Org8	**BENEFITS REALISATION**					
8.1	ERPS has provided the anticipated overall benefits in reality	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
8.2	ERPS has increased productivity of institutes/colleges/departments/centers	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
8.3	ERPS has increased task completion efficiency	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
8.4	ERPS has reduced overall operational cost as compared to manual working	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

8.5	Error percentage in overall processes has reduced due to ERPS	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
8.6	ERPS provides information throughout organisation required on as, when and where basis	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Org9	**USAGE OF ERPS**					
9.1	In my opinion, ERPS usage in my university is at excellent level	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
9.2	I am satisfied with level of overall ERPS usage	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

Thank you for your participation and time

Departmental layer (Q-Dep)

HE01-D ?

USAGE OF ENTERPRISE RESOURCE PLANNING SYSTEMS IN HIGHER EDUCATION INSTITUTIONS IN PAKISTAN

Agreement to Participate In the Research

Introduction

This questionnaire is designed to implement a research program to analyse the usage of the Enterprise Resource Planning Systems (ERPS) deployed and currently functional in Higher Education Institutions (HEIs) of Pakistan. This system contains multiple functions, which serves as a link for various teaching faculty and administration staff to perform their activities within the computing based environment. This survey is about your experience with the software as being part of this University.

This questionnaire will take approximately 15 minutes. Your time and effort will be highly appreciated. Please give your consent to the following:

☐ **Purpose of Research**
I understand the purpose of research (explained above).

☐ **Research Voluntary Participation**
I have been assured that I am participating in this research with my free consent and I may withdraw from the study at any time without disadvantage or have to give a reason.

☐ **Anonymity**
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☐ **Information Handling**
I understand that the information I share in this questionnaire about my experience and opinion of ERPS will be kept at a secure place. The questionnaire data will be used in statistical software for analysis and then become a part of PhD dissertation. Only the researcher and supervisors will have access to this data.

☐ **Risks**
I have been assured that there are no specific risks associated with my participation in this research.

☐ **Health Issues**
I have been told what although this research does not seek information about my personal health condition. However, if I wish, I can withdraw from my participation at any stage.

☐ **Future contact**
I have been told that I may at some time in the future be contacted again in connection with this or another study.

Researcher: **Zeshan Ahmer** (Signature) ……………………………………… Date………………………….

Lecturer, Institute of Business Administration, University of the Punjab, Lahore &
PhD Student, Business School, University of Hertfordshire, United Kingdom.

If you have any queries, please feel free to contact at 0321-9474023 or z.ahmer@herts.ac.uk & zeshan@ibapu.edu.pk

Please tick [✔] in the box that best represents your answer

DEMOGRAPHICS:

Gender: Male ☐ Female ☐

Age Group (Years) : 21-25 ☐ 26-30 ☐ 31-35 ☐ 36-40 ☐ 41-45 ☐ 46-50 ☐ 51-55 ☐ 56-60 ☐ Above 60 ☐

Highest Education Achieved: PhD ☐ MPhil ☐ Masters ☐ Bachelors ☐

Total Work Experience (Years): 0-5 ☐ 6-10 ☐ 11-15 ☐ 16-20 ☐ Above 20 ☐

Total Experience in Universities (Years): 0-5 ☐ 6-10 ☐ 11-15 ☐ 16-20 ☐ Above 20 ☐

Experience in Current University(Years): 0-5 ☐ 6-10 ☐ 11-15 ☐ 16-20 ☐ Above 20 ☐

Experience Supervising ERPS as Head of Institute/Department/College (Years): < 1 ☐ < 2 ☐ < 3 ☐ < 4 ☐ Above 4 ☐

Dep1	**OPERATIONAL SUPPORT**					
1.1	The users of ERPS are provided with adequate facilities to enhance usage of ERPS	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1.2	The users of ERPS are facilitated in terms of required operational support	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1.3	Management is being helpful in removing hurdles in ERPS usage	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1.4	Management is eager to provide any support that is demanded by staff to enhance ERPS usage	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Dep2	**MANAGERIAL PATIENCE**					
2.1	ERPS users have cooperative behaviour towards ERPS	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
2.2	If users of ERPS resist using the software, then the management tackles it well	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
2.3	Management is committed to increasing the usage of ERPS	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
2.4	Management has taken measures to motivate staff to increase the usage of ERPS	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
2.5	ERPS usage in department has increased due to the motivational measures were taken by the management	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Dep3	**ACTIVE ADVOCACY**					
3.1	Management actively promotes importance of ERPS usage	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
3.2	Management actively stimulates staff to be pro-active in ERPS usage	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
3.3	Staff is actually encouraged by the management to use ERPS	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
3.4	Management active advocacy to increase ERPS usage has improved ERPS usage	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Dep4	**MANAGEMENT PARTICIPATION IN ERPS LEARNING SESSIONS**					
4.1	Management officials participate in ERPS training sessions	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

4.2	Managerial participation in ERPS training sessions positively impacts users of ERPS	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
4.3	Attendance of staff in ERPS training session improves due to managerial participation in ERPS training sessions	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
4.4	Attendance of staff in ERPS training session is not affected due to managerial non-participation in ERPS training sessions	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Dep5	**MANAGERIAL CITIZENSHIP BEHAVIOUR**					
5.1	Management is using its discretionary powers to increase ERPS usage	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
5.2	Discretionary role of management has produced positive results regarding ERPS usage	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
5.3	Management inputs extra efforts to enhance usage of ERPS	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
5.4	Extra efforts put in by management are found to be a key to enhanced ERPS usage	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
5.5	Management happily works for extra hours to increase the usage of ERPS	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
5.6	Management working extra hours inspires staff to happily work for long hours to achieve ERPS usage targets set by management	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Dep6	**POWER SHARING**					
6.1	Management delegates authority to staff regarding decision making of ERPS	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
6.2	Management trusts on capabilities of staff in context of ERPS	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
6.3	Management feels that power sharing is an important tool in increasing usage of ERPS	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
6.4	Power sharing with staff has motivated them to contribute positively to usage of ERPS	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
6.5	Power sharing has positively influenced the usage of ERPS	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Dep7	**PERFORMANCE BASED REWARD POLICY**					
7.1	Management encourages staff to maximise performance of ERPS usage	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
7.2	The performance of ERPS usage is measured by management	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
7.3	Financial rewards are awarded to motivate staff based on efficient performance regarding ERPS usage	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
7.4	Staff showing ERPS performance commitment are awarded monetary rewards	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
7.5	Performance based reward policy positively impacts ERPS usage	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Dep8	**USAGE OF ERPS AT THE DEPARTMENTAL LAYER**					
8.1	In my opinion, ERPS usage in my university is at excellent level	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
8.2	I am satisfied with level of overall ERPS usage	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

Thank you for your participation

End-user layer (Q-Eu)

HE01-D -E ?

USAGE OF ENTERPRISE RESOURCE PLANNING SYSTEMS IN HIGHER EDUCATION INSTITUTIONS IN PAKISTAN

Agreement to Participate In the Research

Introduction

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This questionnaire will take approximately 20 minutes. Your time and effort will be highly appreciated.

Please give your consent to the following:

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☐ **Research Voluntary Participation**
I have been assured that I am participating in this research with my free consent and I may withdraw from the study at any time without disadvantage or have to give a reason.

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☐ **Information Handling**
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☐ **Risks**
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☐ **Health Issues**
I have been told what although this research does not seek information about my personal health condition. However, if I wish, I can withdraw from my participation at any stage.

☐ **Future contact**
I have been told that I may at some time in the future be contacted again in connection with this or another study.

Researcher: **Zeshan Ahmer** (Signature) ……………………………………… Date………………………….

Lecturer, Institute of Business Administration, University of the Punjab, Lahore &
PhD Student, Business School, University of Hertfordshire, United Kingdom.

If you have any queries, please feel free to contact at 0321-9474023 or z.ahmer@herts.ac.uk & zeshan@ibapu.edu.pk

Please tick [✔] in the box that best represents your answer

DEMOGRAPHICS:

Gender: Male ☐ Female ☐

Age Group (Years) : 18-25 ☐ 26-30 ☐ 31-35 ☐ 36-40 ☐ 41-45 ☐ 46-50 ☐ 51-55 ☐ 56-60 ☐ Above 60 ☐

Highest Education Achieved: PhD ☐ MPhil ☐ Masters ☐ Bachelors ☐ Intermediate ☐ Matriculation ☐ Under Matriculation ☐

Number of Years in Employment: 0-5 ☐ 6-10 ☐ 11-15 ☐ 16-20 ☐ Above 20 ☐

Experience in Universities (Years): 0-5 ☐ 6-10 ☐ 11-15 ☐ 16-20 ☐ Above 20 ☐

Experience in Current University (Years): 0-5 ☐ 6-10 ☐ 11-15 ☐ 16-20 ☐ Above 20 ☐

Experience as ERPS User (Years): < 1 ☐ < 2 ☐ < 3 ☐ < 4 ☐ Above 4 ☐

Eu1	**TRAINING**					
1.1	University has arranged ERPS training for staff	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1.2	I have attended the ERPS training sessions arranged by the university	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1.3	Management has motivated me to attend ERPS training sessions	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1.4	I feel comfortable with ERPS usage after attending training sessions arranged by the university	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1.5	In training provided by university, training staff was considered technically sound	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1.6	I was asked to give feedback on training sessions arranged by the university	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1.7	I did notice improvement in training sessions conducted after feedback I gave	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Eu2	**LEARNING ORIENTATION**					
2.1	I feel self-motivated to learn new things	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
2.2	I feel positively oriented towards learning ERPS	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
2.3	I want to improve my abilities through self-learning	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Eu3	**ACCEPTANCE AND USAGE OF SYSTEM**					
3.1	I have accepted that I have to use ERPS for my tasks completion	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
3.2	I use ERPS on regular basis to complete my official tasks	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

3.3	I feel comfortable while using ERPS to complete my routine tasks	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Eu4	**PARTICIPATION AND SUPPORT**					
4.1	Management allows me to take part in the decision making relevant to my ERPS work	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
4.2	I am respected on any immediate decisions taken regarding ERPS without involvement of the management	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Eu5	**RESISTANCE**					
5.1	I did resist the usage of ERPS	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
5.2	I was not ready to accept the change from manual to automatic system	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
5.3	I resisted leaving the traditional system	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Eu6	**EASE OF USE**					
6.1	In my opinion, ERPS is user-friendly	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
6.2	I find ERPS easy to use	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
6.3	ERPS provides interface that is easy to understand and operate	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Eu7	**USEFULNESS & USER SATISFACTION**					
7.1	ERPS has enabled me to perform my work more effectively than before	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
7.2	ERPS is a useful system	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
7.3	I have found ERPS very helpful in completing day to day tasks	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
7.4	ERPS in usage is as per requirements of users to complete their tasks efficiently and effectively	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Eu8	**USAGE OF ERPS AT THE END-USER LAYER**					
8.1	In my opinion, ERPS usage in my university is at excellent level	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
8.2	I am satisfied with level of overall ERPS usage	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

Thank you for your participation