An Investigation of the Factors Leading to ERP Obsolescence in Higher Education Institution in Saudi Arabia: A Case Study

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Abstract

The implementation of Enterprise Resource Planning (ERP) has increased substantially over the last few decades. In business organisations of any size and in many countries and sectors, almost every project today uses an ERP system, with various degrees of complexity and dependency. Reviewing the related Information Systems (IS) and ERP literature has shown that only a very small number of research studies have considered ERP in Higher Education Institutions (HEIs), with the majority of studies focusing on other business contexts.

In addition, it has been found that most of the literature discusses issues related to the adoption of ERP and the related success stories; in fact, ERP implementation is not the end of the journey. Very often, the ERP post-implementation stage is where the more crucial challenges begin, mainly involving a change in either the internal or external environment of organisations as a result of the rapid growth of technology. ERP/IS has become a victim of these challenges, which has led to an increased possibility of obsolescence. Obsolescence is associated with many costs for organisations if not checked and controlled proactively. However, the current literature indicates that no major research has been undertaken in the area of ERP obsolescence.

In order to address this issue, the researcher investigated the factors that led to the ERP obsolescence phenomenon in a public university in Saudi Arabia. A Grounded Theory (GT) approach was adopted as the overarching methodology to guide the data collection and analysis in this single case-study design, using a semi-structured telephone interview method involving 17 informants, namely managers, decision makers and IT staff. Through this analysis, two main categories of obsolescence emerged: internal environmental obsolescence (IEO) and external environmental obsolescence (EEO). The four general types of IEO were found to be System Obsolescence, Organisational Obsolescence, Human Resource Obsolescence and Management Obsolescence. EEO was found to take the form of Policies and Restrictions Obsolescence, Competition Obsolescence and local IT market Obsolescence. Further to these types of obsolescence, this study identified widely different factors that contributed to obsolescence such as network issues, legacy-based issues, maintenance issues, new system advantages, integration issues, university business process changes, professional specialist unavailability, governmental policy issues, educational system issues, economic issues, consultant influence and vendor issues.

The findings conclude that both IEO and EEO impacted on the university system. Internally, this involved a lack of updating of any part of the system, including software, hardware and/or human aspects for which the actors involved were responsible, which had a wide impact and made the system obsolete. Externally, changes in governmental rules and in the market also negatively influenced obsolescence. The findings also show that the IEO and EEO interacted with each other to accelerate obsolescence. It was concluded that a compatibility mechanism dealing with system component challenges caused by component misalignment, in order to avoid the obsolescence that leads to regular replacement. Consequently, this research shows the importance of looking at obsolescence not only at the component level or from a technical perspective but more importantly at an organisational and extra-institutional level, in particular focusing on problems associated with the human dimension. The outcome of this study offers theoretical and practical contributions across many ERP/IS areas which have been neglected in previous studies.

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Chapter 1: Introduction

1.1 Background

Enterprise Resource Planning (ERP) is one of the most common and complex software packages used by organisations to integrate and share information across the entire organisation. Accordingly, ERP is defined differently by many scholars (Davenport, 1998; Stair & Reynolds, 2010) but among the most comprehensive definitions is that provided by Razmi et al. (2009).

"*ERP systems are integrated, complex and corporate-wide systems that automate core activities such as manufacturing, human resources, finance and supply chain management. In such systems, the fragmented information is integrated to support the decision-making process*" (p. 1186).

In light of this definition, it can be seen that the implementation of ERP systems leads to the enhancement not only of organisational performance and efficiency, but also profitability. Regardless of the variations in the way the concept of ERP systems is understood or seen, there are certain elements that all ERP system modules should possess (Wu & Wang, 2006). Sheu, Yen, and Krumwiede, (2003) note that one of the distinguishing features of ERP is that software packages encompass business-specific modules. The ERP system connects the functions of modules to each other, as well as to the overall database. In addition, by granting managers and users access to real-time operations, this module integration facilitates the exclusion of detrimental processes and cross-functional coordination issues.

Despite the complexity and difficulties involved in the adoption of such packages, their use has increased significantly since they were first discovered by manufacturing companies, followed shortly afterwards by governments and universities (Zornada & Velkavrh, 2005). Abugabah and Sanzogni (2010) outlined the difference between the use of ERP systems in academic and business environments. They noted that ERP systems are used by higher education institutions (HEIs) for academic and administrative purposes, whereas business organisations employ them for business reasons. Generally speaking, the business carried out by universities is for non-profit purposes, as they are governmental institutions; however, this statement is not entirely correct in the case of private universities, as they have a business vision. ERP systems

are highly valuable in the academic environment, as they support interaction among faculties, students and staff in the context of academic and administrative activities.

From the perspective of Swartz and Orgill (2001), universities use ERPs to improve accessibility to information, in order to enhance workflow effectiveness within and outside the organisation's operational systems. Pollock and Cornford (2004) added that ERPs in HEIs are expected to manage complex databases that include huge amounts of information related to administrative staff, students and faculty members, as well as building operations or infrastructure, equipment, documents and financial transactions. Therefore, such organisations encourage many IT developers to produce software which is able to deal with specific functions of universities, such as finance, human resources and project management, which involve keeping and maintaining student records. Wagner and Newell (2004) stated that HEIs are experiencing increased pressure to improve their functionality. Accordingly, the implementation of any ERP project must be based on a clear awareness of a wide variety of factors and stakeholders, including university management, administrators and software vendors. At the same time, ERP vendors should look to the higher education (HE) context as a profitable market for their products, in the process of modernising back offices and administrative functions via integrated technology platforms.

In the same vein, Rabaa'i, (2009) and Rabaa'i, Bandara, and Gable (2009) observed that the main aim of implementing ERP systems in HEIs is to accomplish strategic benefits, namely to: (1) provide better access to information for planning and management teams; (2) enhance the quality of the service for faculty, students and employees; (3) reduce the business risk; and (4) increase revenues and decrease expenses due to improved efficiency. Such aims can be achieved by incorporating different administrative functions into less costly and more systematic structures.

The literature contains a few success stories regarding the implementation of ERP systems in universities. For example, Georgetown University successfully adopted PeopleSoft, which is a type of ERP system, to automate the processes of financial support and admission for over 30,000 students (Blitzblau & Hanson, 2001). Abu Dhabi Education Council (ADEC, UAE) implemented an ERP system (eSIS) which facilitated the efficient organisation of student data on daily attendance, registration and admissions (ADEC, 2011, cited in Al Kilani, Adlouni, Al Ahbabi, & Al Yahyaei, 2012).

By contrast, many studies indicate that the failure rate of ERP implementation in universities is higher than in business companies (Abugabah & Sanzogni, 2010). Technical problems and critical factors which include top management, support, training and human obstacles were cited as the major barriers to ERP implementation at an Australian university (Botta-Genoulaz & Millet, 2005).

The current literature review also indicates that the ERP implementation stage has been the focus of many researchers' interests for more than two decades. On the other hand, many scholars stress that ERP in the post-implementation stage takes up the longest period of time and is where the most crucial challenges begin (Willis & Willis-Brown, 2002; Peng & Nunes, 2009). According to the Chaos Reports published by Standish Group over the past 20 years, as cited in Peng & Nunes (2012), ERP/information systems projects globally have a success rate of only about 16–39%; in contrast, the failure rate has been 15–40%. More importantly, even if the system eventually goes live, 33-53% of user companies still find different challenges with their ERP system and its environment. Despite the existence of these challenges, the current ERP literature on the post-implementation of ERP systems in general and in HEIs in particular is less researched than other phases (Sullivan, 2009; Althonayan, 2013; Ahmer, Demir, Tofallis, & Asad, 2016). It is impossible that the challenges in this stage are less important than in other stages, but the reason for this lack of research might be due to the difficulty of obtaining information about organisations, since they tend to reject any negative images and data emerging about them. Alternatively, perhaps the organisation has not reached this stage yet and faced many problems with the prior stage.

The previous studies focused on ERP failures, aiming at identify the factors that can impact on ERP performance and which can culminate post-implementation in system replacement (e.g. Gattiker & Goodhue, 2005; Yu, 2005; Federici, 2009; Peng& Nunes, 2009; Salmeron & Lopez, 2010; Pan, Nunes & Peng, 2011; Haddara & Elragal, 2012); These studies indicate different technical and non-technical problems that occurred in the ERP post-implementation stage. However, they simply link these ERP problems directly with ERP replacement, and ignore the phenomenon of ERP obsolescence. In fact, these technical and non-technical problems will firstly cause different types of ERP obsolescence, which will then eventually lead to ERP replacement. This layer of thinking is missing from the current body of knowledge; examining the current literature shows that there is a knowledge gap and shortage of theory and data support, due to a misunderstanding of the concept of obsolescence in relation to IS and a lack of

research on this important phenomenon. Ignoring this vital issue is likely to increase the risk of system failure, and lead to software obsolescence and resource wastage, especially if existing resources have to be replaced before their time. Simply replacing these resources with further available technology assists organisations in addressing their organisational and socio-technical problems but does not prevent further obsolescence. Thus, understanding the phenomenon of ERP obsolescence is important in order to provide proper guidelines for organisations to manage obsolescence and extend the life of the system, where practicable.

When examining the ERP literature, it was very difficult to understand and define the meanings and conceptions of obsolescence. Interestingly, as the author investigated the ERP literature, she was unable to find sophisticated information in different contexts (including Western and other contexts such as the Chinese context); hence, she decided to include IS literature in the literature review search strategy. By further reviewing product obsolescence in other research areas, such as manufacturing studies, it was possible to consider ERP as a product, which allowed the author to review the term 'obsolescence'. For example, Brown, Lu, and Wolfson, (1964) explained that this word can refer to other words, such as 'sudden', or 'inventory'. This suggests that obsolescence can be defined as an inventory of parts that remain after the demand for them has disappeared. A different view was put forward by Baer & Wermake (2000), demonstrating that the term is rooted in the Latin word 'obsolescere', which means to become "*out of use or out of fashion*". According to the Oxford English Dictionary, obsolescence can be defined as "*the state of being which occurs when an object, service or practice is no longer wanted, even though it may still be in good working order*". Tomczykowski (2003) stated that words such as 'procurement' or Diminishing Manufacturing Sources and Material Shortages suggest that the product is still functioning perfectly well, but specific factors act to remove, change or replace it. According to Bartels, Ermel, Sandborn, and Pecht, (2012) obsolescence refers to "*materials, parts, devices, software, services and processes that become non-procurable from their original manufacturer or supplier*" (p. 2).

For the purpose of this research, the researcher slightly modified and combined the above definitions given by Bartels et al. (2012) and the Oxford English Dictionary, defining obsolescence as "*the state of being which occurs when an object, service or practice is no longer wanted, even though it may still be in good working order, but*

where specific factors act to remove, change or replace it" (p. 1). Further discussion regarding obsolescence and its various causes are provided in the next chapter.

Challenged by ERP obsolescence, many organisations incur costs by having to replace the whole existing ERP package with a new system as a rapid solution (Weerasuriya & Wijayanayake, 2014). However, the question to be posed is, when this situation occurs, is a new system necessarily the best answer? This is debatable if such a change is implemented with the same poor planning as in the first cycle; in fact, the result is likely to be the same.

Unfortunately, most of the current literature identifies the technical challenges of the system, while non-technical aspects are typically ignored, especially in relation to the obsolescence of an ERP/IS project. Furthermore, there are many studies focusing on ERP post-implementation in Western and Chinese contexts in business organisations, whereas there is a lack of research into the ERP post-implementation stage and its challenges in the HEI sector in general, and in the Kingdom of Saudi Arabia specifically. Some of these challenges can also be understood to relate to obsolescence in its various forms, which has also not been researched to date.

1.2 Context of study

Between the Red Sea in the West and the Arabian Gulf in the east lies the Kingdom of Saudi Arabia (KSA), one of the Middle East's largest countries, at around 250,000km^2. In terms of the KSA's land borders, in the south are Oman and Yemen, in the east Bahrain, the United Arab Emirates and Qatar, while in the north are Jordan, Iraq and Kuwait. A map of the KSA is provided in figure 1.1.

Figure 1.1: Map of the KSA

In addition, internationally, the KSA is one of the major exporters of oil. Modern infrastructure such as power stations, new cities, telecommunications networks, medical care and roads have all been built using the profits from oil, while other benefits have been that parts of the desert have been reclaimed and the economy differentiated. All of these factors gave it the opportunity to further develop its communications and business sectors, with the potential to succeed in global e-business. In an Arab newspaper (2015), Abdulaziz Al Helayyil (a regional director for Saudi Arabia, Kuwait and Bahrain) stated that the Saudi information and communications technology (ICT) market is highly competitive, and will reach a total value of $3.9 billion in 2016, as organisations across the Kingdom have started to embrace digital transformation initiatives in an effort to enhance costs and improve business efficiency. In particular, these economic elements ease the emergence of technology, including the ERP systems deployed in various sectors across a range of fields, such as production, banking and governmental departments, and the HE sector. Figure 1.2 shows the usage of different types of ERP systems, such as Systems Applications and Products (SAP), BAAN and Oracle; only around 47% of organisations do not use ERP at all (Otaibi & Al-Zahrani, 2004).
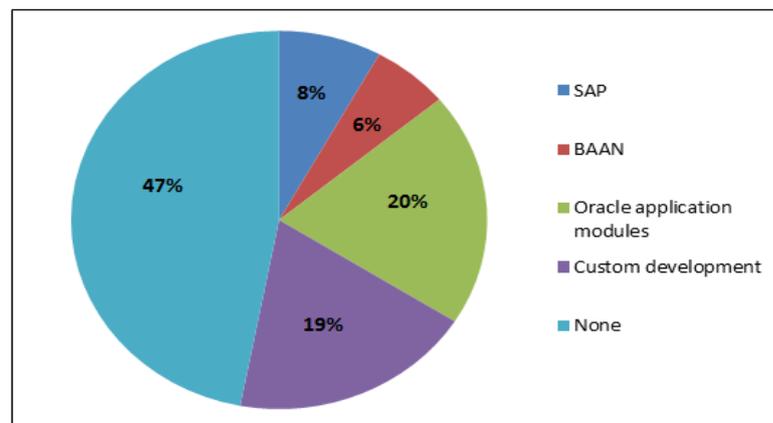
Figure1.2: ERP usage in the KSA (adapted from Aldayel, Aldayel & Al-Mudimigh, 2011)

As noted in the 9th Economic Social Development Plan, the Saudi government has switched to an electronic operations system in order to keep pace with the rapid development of IS in today's competitive environment. The KSA's HE institutions (HEIs) are typically regarded as centres of cultural and scientific production, with a strong emphasis on science, state of the art technological developments, as well as an effective and robust education overall. KSA's HE system is shaped by the country's Islamic culture, values and organisations, which have altered what is effectively a HE system that is based on the U.S. model. Both investment by international HE institutions

and denationalisation of HE have been the most recent developments in a constantly changing system. Ultimately, KSA's HEIs have several shared goals: providing individuals the chance to obtain a degree indicating their considerable understanding of a subject; adherence to the education committee's legislation and guidelines; engagement in research, innovation and dissemination of scientific knowledge as a major focus, alongside allowing ordinary citizens to access the HEI's resources and amenities. Nevertheless, total investment and available assets is what distinguishes the various HE institutions, with the Minister essentially responsible for distributing resources. Thus, ownership standing and associated investment, state investment, as well as funding availability for cooperation between academics, HEIs, amenity accessibility and scientific investment are examples of factors where income variability is seen. The task of maintaining pace with rapid technological advancements, meeting the labour market's future requirements for skilled professionals and providing a high value education, academic environment and amenities to students is all required from a HEI, through the funding and resources that they are assigned.

There are now 25 public university establishments across the KSA and six private ones, and the number is increasing gradually. The Ministry of Saudi Arabian Higher Education (2015) further ensures that each of these universities in the KSA is granted a certain amount of funding from one sizeable pot of money, according to its needs. Twelve universities have adopted an ERP system, and the numbers are increasing here too and few of them in the post-implementation stage (Althonayan 2013; Awad 2014)

1.3 Rationale of study

From reviewing the literature, it has been clearly identified that ERP systems go through different stages during their lifecycle in organisations (see Section 2.5.2). As seen in Figure 1.3, the lifecycle stages start with the identification of organisational needs that require the implementation of such a system, followed by the selection of a new ERP package and then the customisation of the system. Once this implementation is complete, real use and exploitation of the ERP begin, and it is then evaluated for its suitability to address organisational needs. This evaluation should result in further identification of needs and customisation following a natural iterative cycle of improvement of ERP implementation in the organisation. It is important to mention that these are the main stages any ERP cycle is expected to go through; however, there are

accidental activities that might occur, such as replacement activity, which can occur at any time or stage after implementation (Figure 1.3).
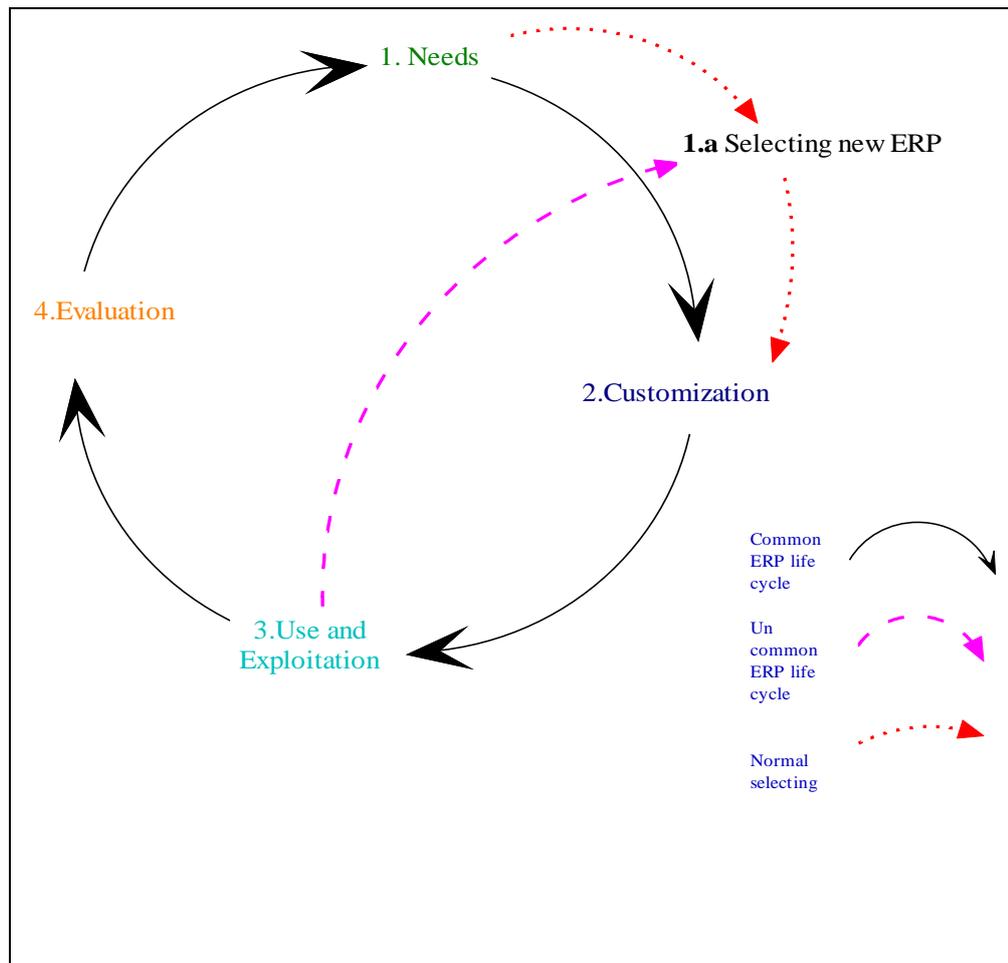
Figure1.3: ERP Lifecycle (developed by the author)

However, in Saudi HEIs, it seems that during the use and exploitation (post-implementation) stage, universities replace their ERP systems without even undertaking a systematic evaluation, thereby breaking with the natural ERP lifecycle. This realisation emerged from a previous Master's dissertation and the author's professional experience within the Saudi HE sector. These, in turn, sparked an interest in this PhD research and established the research questions below. Given the type of challenges involved in ERP systems in the academic environment, and the prevalence of hasty and immature decisions to overcome these issues, the researcher highlights a number of aspects that should be addressed in the following statement of the main aim of this study:

The aim is to investigate the factors that contributed to ERP obsolescence in HEIs. One large university specifically a Saudi university is selected as a case study, taking into consideration the circumstances in which the institution has recently replaced its local ERP system with another ERP system.

1.4 Research questions

In order to respond to this main research aim, three research questions are proposed that need to be answered:

1. What are technical and management staff perceptions of ERP obsolescence in a Saudi HEI?
2. What are the factors that influence the perception of ERP obsolescence in HEI in Saudi?
3. How can these factors be integrated into a theory of ERP obsolescence in Saudi HEIs?

1.5 Research objectives

In response to the research questions and research aim, a set of specific research objectives is established:

- To review the literature about the research context, focusing on IS/ERP in Saudi organisations in general and HEIs in particular in order to obtain a general understanding about the research context and to develop contextual sensitivity;
- To conduct a literature review on ERP post-implementation challenges and difficulties associated with obsolescence in general and in the Saudi context in particular, The purpose of this literature review is not only to enhance the theoretical sensitivity, but also to identify an appropriate theoretical framework to guide the remaining research stages;
- To determine the research approach, research methodology, tools and techniques for data collection and analysis as well as establish an appropriate research design;
- To identify an appropriate, adequate and accessible site for the data collection as well as the potential research participants;
- To analyse the data in order to identify different types of obsolescence and their related factors that lead to ERP system obsolescence and to organise these types into categories and sub-categories;

- To determine the relationships between categories, sub-categories and sub-sub categories;

- To conceptualise the research findings in order to initiate a theory and thus answer the research questions;

- To compare ERP obsolescence in the Saudi context with other contexts, as reported in the literature;

- To provide contributions to knowledge and develop recommendations for practice through the reflection on the research project.

1.6 Motivation for study

From an educational background perspective, the researcher's Master's degree included a study of ERP systems in the private sector in the KSA (AlJohani, 2012), which aimed to evaluate the performance of ERP (enterprise resource planning) systems with respect to organisational factors in Saudi Airlines (top management support/commitment, training and education, enterprise-wide communication) that were likely to influence its success or failure. The study did not evaluate the effect on the technical aspects or on human resources; nor did it discuss the political, cultural and economic factors involved in the successful implementation of ERP.

Moreover, the researcher found the survey methodology used during the Master's project to be limited, as it hindered participants from providing insights, and made it difficult to capture their views and experiences in real-life situations. After completion of her MA degree, she started thinking about conducting PhD research into ERP systems in the public sector but found only a few studies on this phenomenon, and very little which was relevant to KSA HEIs, in particular. In the KSA, a large amount of money is spent on developing HEIs, especially on the implementation of IS and ERP (The Ministry of Saudi Arabian Higher Education, 2015; Awad, 2014; Al Helayyil, 2015), in order to help HEIs to deal better with the ERP post-implementation challenge.

Considering both the identified limitations of the Master project and the literature, the researcher became intrigued by how these systems were adopted and used, and what challenges HEIs might face when implementing them. One challenge identified was ERP obsolescence. This layer of thinking is missing in the current body of knowledge, where there is a lack of empirical studies. As a result, obsolescence of ERP in the public sector was chosen as the topic of this research, and qualitative interviews were chosen

as the main data collection method, in order to generate more knowledge about this important area of IS processes and practices.

In terms of personal benefits and her future career, as the researcher is looking to work in academia, it was logical to conduct this research on the HE sector in order to enhance and improve her understanding of this sector. It also concerned her that most Saudi authors, users of ERP and managers are males, which motivated her to study for a degree in ERP systems, specifically in the public sector, which she had studied at Master's level in the UK. Conversely, in the KSA, this area is not studied as a subject, which means that most existing ERP users rely on training that has insufficient background about the system and its relationship to other organisational components.. The researcher was also motivated to focus on the KSA, where she was born and completed her education, due to her understanding of both the culture of HE and the Saudi context.

1.7 Structure of thesis

In order to present the research background, progression of theory, research processes and findings clearly, the thesis comprises six chapters.

Chapter 1 provides information on the basis for this study. The researcher presents the background to the problem. Following this, she identifies the context and nature of the problem, and then presents the aims, objectives and research questions for this study. The justifications and motivations for undertaking this study then follow.

Chapter 2 discusses issues related to the term 'information systems' and how it is presented in the literature. Issues related to the functions, types and benefits of implementing information systems in organisations, including Saudi HE institutions in different contexts, are discussed. This chapter also discusses the main focus of this study, namely ERP systems. The researcher provides definitions of the term and investigates different issues relevant to ERPs, including their evolution and difficulties. Much attention is paid to the use of ERP systems in HEIs in general, and in the KSA in particular.

Chapter 3 presents the methodological basis for this research, including the philosophies, research strategy, research approach, data collection methods and data analysis techniques. The main aspects of the research process, along with their validity,

reliability and trustworthiness, are presented, before an overview of relevant ethical considerations is presented.

Chapter 4 presents and discusses the emergent theory of ERP obsolescence in a Saudi HEI, as experienced by both technical and managerial staff. This is achieved through the use of quotes from interview transcripts and their interpretation, illustrated with concept maps that demonstrate the interrelationship between categories, sub-categories and codes derived from the coding, thereby answering the research question and achieving the research objective. Then, a summary of the research findings is provided.

Chapter 5 presents and compares the integrated model that emerges in this research with the existing literature models in different areas, including general product, information system obsolescence and ERP replacement. This chapter also identifies contributions to the existing body of knowledge in these different areas and links the research findings to the reality of practice.

Chapter 6 sums up the overall study. Specifically, it provides answers the research questions, points out limitations and offers a reflection on the research methodology. Finally, it offers suggestions for future research.

Chapter 2: Literature review

2.1 Introduction

In the early stage of this research, the researcher reviewed different areas of ERP studies, including the challenges and difficulties of ERP post-implementation. The researcher found that there was a lack of studies on ERP obsolescence in the ERP field, and decided to perform a more systematic literature search aimed at identifying theoretical frameworks to guide the collection and analysis of data. Here again, after careful and close examination of these areas, it was obvious that there was a scarcity of literature on this phenomenon; this led the researcher to examine the IS obsolescence literature instead. At the time, the retrieved articles could not be considered as providing a sufficient theoretical foundation for this project. Therefore, the researcher decided to examine the product obsolescence literature, since an ERP system is a product, for the same reason identified earlier, namely that the existing literature was evaluated as being unable to provide a sufficient theoretical foundation to adopt as a prior framework to guide the data collection and analysis. Thus, the indicative approach was selected and aims to produce an initial theory as the basis for future research, as further justified in the next chapter.

In fact, this research could be the first study to investigate ERP obsolescence. The final theory is more likely to emerge from and be grounded in the data. Therefore, this research adopted Grounded Theory (GT) as the overarching research methodology to guide the data collection and analysis in a single case study design. Aligned with the GT principle, this literature review is fairly general and aims to cover topics that will allow contextual and theoretical sensitivity to be obtained.

According to Dunne (2011), the use of the literature in GT can be a problematic issue because concerns have been addressed about how and when PhD researchers can review the literature. For example, Glaser and Strauss (1967) advised against conducting a literature review of the studied topic at the early stage of the research. However, Corbin and Strauss (1998) had a significantly different view, suggesting that a brief review of the relevant literature in the early stage of GT research can be helpful to enhance theoretical and contextual sensitivity. Theoretical sensitivity reflects the understanding of theory around ERP obsolescence and contextual sensitivity enables the researcher to understand, contextualise and interpret the responses of participants. Having theoretical and contextual sensitivity indicates an awareness of the weaknesses of the use of data.

Based on the discussion above, different topics need to be examined to achieve theoretical and contextual sensitivity, and those topics should be addressed in a literature review. The diagram below demonstrates which topics in this chapter are addressed widely in the literature and which are addressed narrowly.
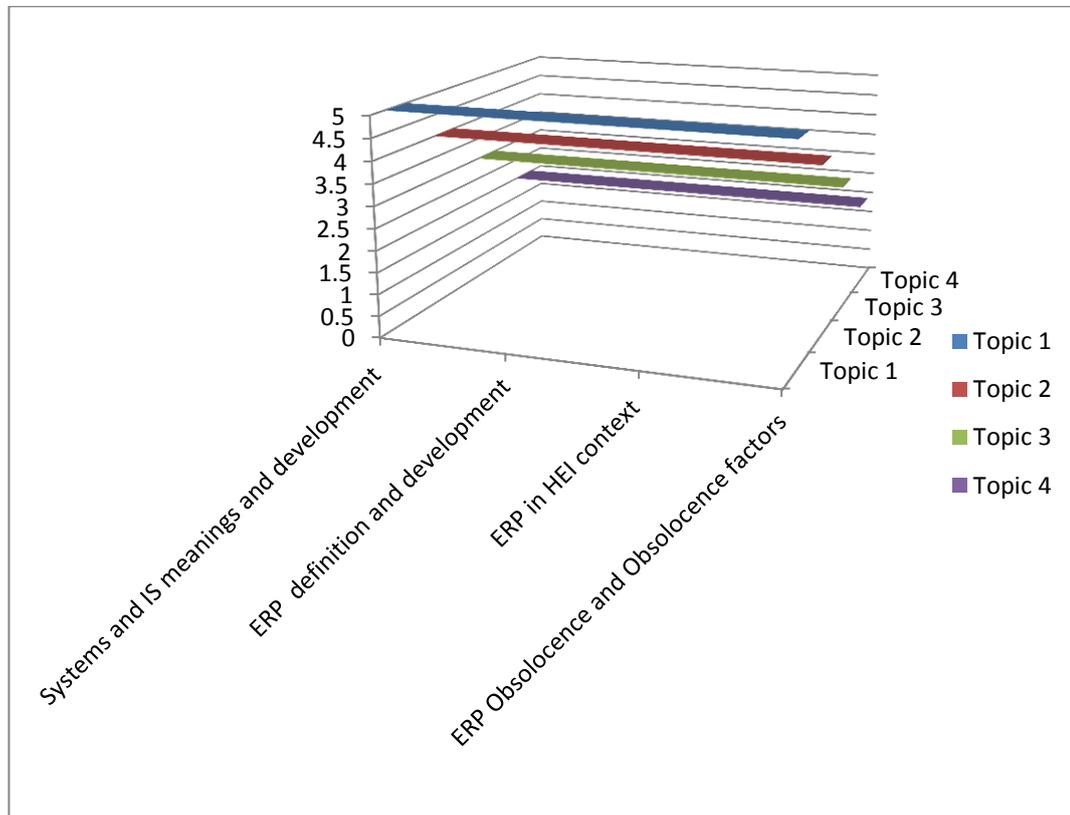
Figure 2.1: Areas involved in shaping the current chapter

As can be seen from Figure 2.1 above, ERP obsolescence factors (which are the main concerns of this study) have not been addressed widely in the literature. However, other related topics which can pave the way towards a better understanding of this topic, such as the development and use of ERP in HEIs, were addressed in a more comprehensive manner.

2.2. Systems and information systems

This section presents and discusses the results derived from a literature review on IS in general, since in order to understand the specific phenomenon of ERP, it is important to understand firstly more general aspects of IS. Therefore, this section is divided into two subsections, namely a definition of 'system' (Section 2.2.1), followed by a discussion of information systems development, meanings, components and functionality (Section 2.2.2).

2.2.1 Definition of systems

The term 'system' has been used widely in the literature to represent different meanings and conceptions. Hall and Fagen (1956) describe it as "*A system is a set of objects together with relationships between the objects and their attributes*" (p. 18). Later, in 1981, Harary and Batell viewed the earlier definitions of a 'system' provided in the descriptive method as more of an analytic approach. They were therefore able to formulate a new definition and model for a general system in graphical-theoretical terms, a concept introduced to computer science related to the study of graphs, providing a mathematical structure to model pairwise relations between objects.

According to Laszlo and Krippner (1998), after the 1990s the development of System Theory enhanced the meanings of systems and changed general perspectives on what systems could mean, what their components are and how a system interacts with the surrounding environment. In addition, Laszlo and Krippner (1998) adopted Rapoport's (1968), saying that people chose and designed their systems based on their vision of what a system should do and what it should be. People usually seek a design system that has a 'good fit' with the dynamics of their society, with their own expectations, and with the expectations of their milieu. Beynon-Davies (2013) asserted a system is comprised of an array of different interactions and connections between various entities that are part of the practical environment around us (Beynon-Davies, 2013). Consequently, entities can be affected by the interactions between other entities, with such interactions suggesting the 'networked' nature of a system. Beynon Davies (2013) proposed that the conduct, function and associations of the entities determined the nature of the system. Moreover, systems as a whole may or may not interact with other aspects of the world. If it does not, then the system can be considered in isolation as a 'closed' system. If a system impacts upon and is impacted by the surrounding world, it can be deemed an 'open' system. Figure 2.2 illustrates how a standard transformation procedure characterises each type of system, with outputs produced by the input of objects in to the system being a central aim.
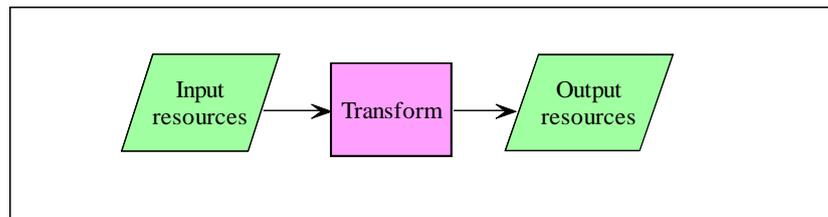
Figure 2.2: Function of systems, adapted from Mcleod (1995)

Every system shares common characteristics, despite the differences that closed and open systems are characterised by. Firstly, Hick (1993) and Bocij et al. (2008) noted that the transfer of outputs and inputs occurs as systems connect. Secondly, Beynon-Davies (2009) suggested that a complete system may be assessed and observed as such, or it can also be considered in terms of the subsystems and components that it is comprised of. Thirdly, Bocij et al. (2003) noted how a greater system's achievement of aims will be facilitated by the activities and aims of underlying subsystems. Thus, any number of systems may impact on and be impacted upon by other systems through alterations that occur. Fourthly, the inputs into a particular system may comprise of the products of another system. Thus, a construction procedure's inputs may be the product of a prior production procedure. Lastly, the context, parameters and aims of the majority of systems are typically self-encompassing. Nevertheless, Hick (1993) and Bocij et al. (2008) explained how certain human produced systems, due to the presence of humans themselves in the system, may have an array of aims, while obscure or intangible aims may be said to characterise others, such as the solar system.

According to Checkland (1981), a HAS system is: "*A notional system which expresses some purposeful human activity. The systems are notional in the sense that they are intellectual constructs and not descriptions of actual real-world activity*" (p. 115). Beynon-Davies (2009) further explained that a HAS is a social or 'soft' system or organisational process, which comprises a logical collection of activities (e.g. recording data) performed by some group of people.

Alter (2002) suggested what he called the 'work system method approach', which helps one to understand and analyse systems in business organisations, and thus whether information technology plays a main role or not. Alter (2002) argued that such an approach should be more common than techniques designed to specify detailed software needs; and that it is designed to be more prescriptive and more powerful than

domain-independent systems analysis methods, such as soft system methodologies. In this sense, in order to enhance the performance of IS in an organisation, there is a need to understand how the work system is performing and the role of IS in terms of supporting the business.

Thus, systems can be seen either from the functional perspective, where technological aspects are involved in the processes of managing, storing and recoding; or systems can be seen from a structural perspective, where a system is expected to consist of a collection of people, processes, data, models, technology and partly formalised language, forming a cohesive structure which serves some organisational purpose or function.

Accordingly, Beynon-Davies (2009) noted that ISs are usually designed to support the relevant HAS, and are frequently named after the HAS. For example, 'Finance IS' supports the Finance HAS and 'the order-processing IS' supports the order-processing HAS (Beynon-Davies, 2009). From the perspective of the researcher, the success of IS is clearly likely to be influenced by the environment of the HAS, therefore the application context should always be taken into account in IS studies.

To sum up, systems are everywhere around us; they consist of many objects which are combined together through relationships. Systems can be either closed or open, and the main functions of a system are input, transformation and output. In addition, the most common systems are those which have their own objectives, boundaries and environment; but at the same time there are some uncommon systems, such as the solar system. In addition, it is apparent that any organisation, public or private, including manufacturing companies, universities and hospitals, will also have a set of sub-HAS, since they all involve people working together to achieve distinct goals in a human activity system. HAS suggests that, alongside IT components, the human element, and relationships between the two, are vital to understanding how systems are working in organisations. In the following sections, the focus will be on information systems (components and concepts) in organisations.

2.2.2 Information systems development, meanings, components and functionality

According to (Wiseman, 1984; Friedman, 2005; Anderson, 2012 as cited in Bourgeois, 2014), the history of IS went through five main eras, starting in 1950, as shown in Figure 2.3.

```
┌─────────────────────────────┐        ┌─────────────────────────────┐
│ 1950–1960                   │   →    │ 1970–1980                   │
│                             │        │                             │
│ Mainframes and manufacturing│        │ First microcomputer (PC)    │
│ resources planning systems  │        │ and Windows operating system│
└─────────────────────────────┘        └─────────────────────────────┘
                                                      │
                                                      ↓
┌─────────────────────────────┐        ┌─────────────────────────────┐
│ Mid-1990s to early 2000s    │        │ Mid-1980s to early 1990s    │
│                             │   ←    │                             │
│ World Wide Web              │        │ Client server, networking   │
│                             │        │ and ERP                     │
└─────────────────────────────┘        └─────────────────────────────┘
            │
            ↓
┌─────────────────────────────┐
│ Mid- to late 2000s          │
│                             │
│ Web 3.0. Mobile computing   │
│ and cloud computing         │
└─────────────────────────────┘
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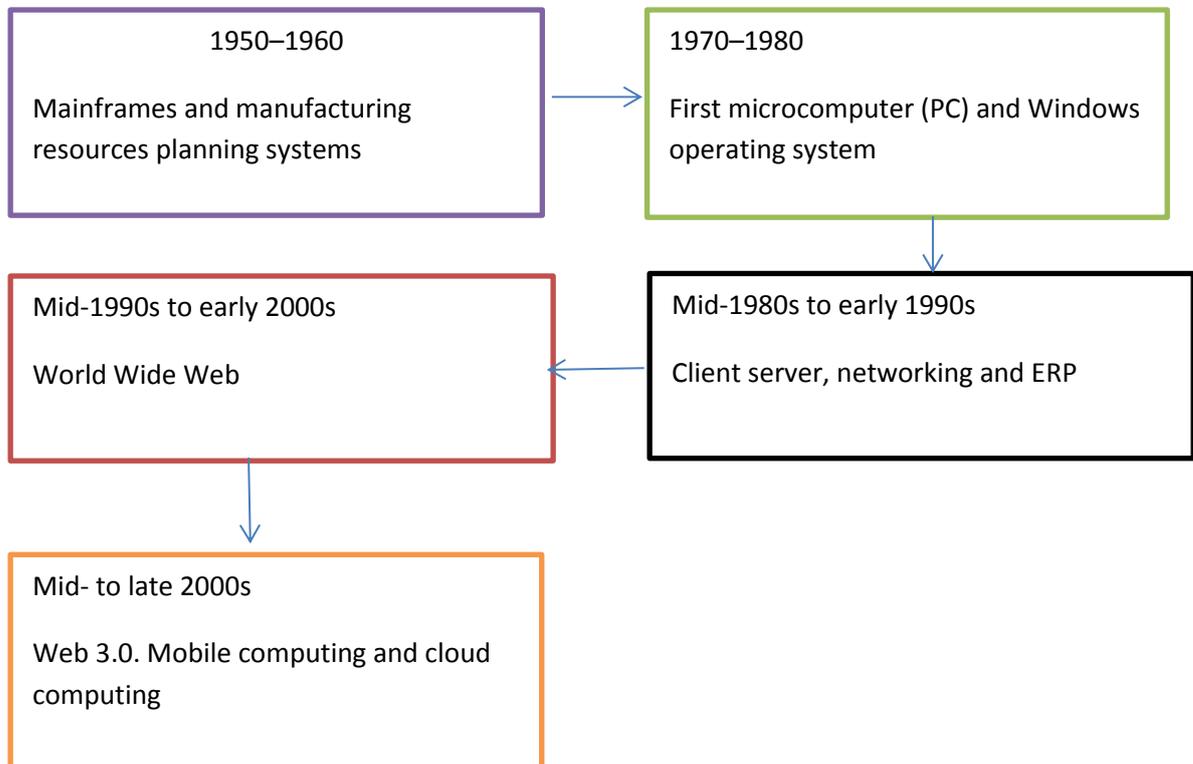
Figure 2.3: The development of IS

Bourgeois (2014) linked the development of IS to the development of the industry and business sectors. This opinion accords with Weske (2010), who stressed that, due to globalisation in the 1990s (which caused a huge amount of data flow), as well as the changes that accrued to the meanings of customer service, organisations supported the development of IS in order not only to enhance the productivity of their customer service but also to control and manage the main components of the business, namely the data (Weske, 2010).

This argument suggests that the main input of any IS is data, which will be processed later into useful information. Therefore, the efficiency of any IS is related to its capacity to apply data transformation processes in order to extract useful information from data. According to Bocij et al. (2003), data are unprocessed facts with "*little or no value until they have been transformed into information*". They add that data are given a

meaningful context by association with a particular purpose, and thus they are converted into information. This in turn can be employed in different activities and tasks, as well as in supporting the decision-making process. The current IS process involves a range of different materials, according to Alter (2002): these could be predefined data items, text, images, video or audio.

Furthermore, data processing represents the procedure through which information is extracted from raw data. In other words, data processing aims and leads to converting symbols into numbers or letters to make them more useful. Therefore, data processing consists of all the tasks required to keep a precise record of organisational operations. The collection of data pertaining to organisational activities is an essential data-processing task, each activity being carefully recorded (Mcleod Jr, 1995). Transactions, such as purchase or stock transactions, are activities which have an environmental element. The subsequent task of data processing is necessary to convert data into a convenient format, via a range of different operations. Prior to inclusion in the records, data elements are categorised to enable their use as codes to identify and classify records, such as payrolls, in which different codes are used to indicate the employee, their department and payroll class. On the basis of such codes, the records are subsequently organised into specific sequences (Mcleod Jr, 1995). Until required, the data are kept in storage and can be accessed by organisational members, as well as by outsiders (Mcleod Jr, 1995)..The data transformation processes above give an idea of the basic functionality of IS in general and ERP in particular, since the main goal of ERP systems is to integrate the applications that an organisation uses to connect its business activities across departments, so that everyone is working with the same data and processes (Seo, 2013).

The data transformation processes outlined below present different types of data-processing systems, as defined by Mcleod Jr, (1995). Originally, data-processing systems were manual, with people using ledger books to record information in paper-based systems. Subsequently, key-driven machines were developed to expedite the processing of extensive amounts of data. To record transactions, large-scale companies began to employ punch-card machines, which facilitated necessary file maintenance and processing. The status of a company was recorded in the holes in the punched cards. The majority of punched card machines have nowadays been replaced by computers, which means that data processing has largely become automated. Nevertheless, the data processing systems of some companies today remain quite small, and show certain

deficiencies. To overcome these, companies integrate different types of data-processing systems, combining computers, key-driven machines and manual systems.

Before going into more details of IS, it is important to identify a common misunderstanding about what this is, as a result of the interchangeable use of the terms 'information systems' and 'computer-based systems' (CBIS). Table 2.1 below identifies the differences between these terms from various perspectives:

Table 2.1: Distinction between IS and CBIS

Perspective	Author	Description	Characteristics
Manual	(Caldeira & Ward , 2002; Bocij, 2003)	They argue that it is a mistake to fall into the habit of referring to any IS as a CBIS, since the basic tasks of an IS is to create and convert data into information targeted at a specified goal, a task which can also be accomplished manually (for example, a paper-based system).	• Manual systems may be slow and unable to deal with large volumes. • Furthermore, manual systems may be less accurate and inaccurate information can lead to poor decision making.
Computerised	(Alter, 2002; Beynon-Davies, 2002; Avison & Fitzgerald, 2003; Bocij et al., 2003)	While acknowledging that IS are not necessarily computer-based, the scale of today's business and the overwhelming use and growth of IS is based on recent advances in computer technology. They also argue that a CBIS refers to the utilisation of anything connected with computing technology, whether hardware, software, networking, or the internet.	• Computers can process data speedily and accurately, and provide information when and where required. • Computers can automatically check for errors. • The storage capacity of computer systems is also much larger than that available in manual systems. • Computers can likewise ensure that data are kept

			safe, with passcodes or encryption software being used.
Sum of computer systems and social subsystems (people, business processes, social structure and culture)	(Olsen & Kesharwani, 2010)	They argue that the term 'IS' not only refers to the technology but also includes HAS, in which the focus is on humans, such as how the information produced by the system can be used to improve human performance, and how the system is maintained and managed.	

After defining these differences between IS and CBIS, it can be concluded that all these characteristics hold true for ERP (see Section 2.5), since it is a computer-based system running on advanced PC programs. This implies that an ERP system will enable the processing, accessing and sorting of data and information to be carried out speedily, accurately and securely (Peng, 2009).

Furthermore, according to Alter (2002), the reason IS has different meanings is because organisations have different needs and different inputs. Therefore, Alter (2002) suggested that, when it comes to understanding the meanings of IS, the following components should be considered: Customers, Products (and services), Business processes, Participants, Information and Technology.

Alter (2002) presented the above list of entities in a model, as seen in Figure 2.4. In his model, (Alter, 2001a; Alter, 2001b; Seddon, et al, 1999 as cited in Alter, 2002) aimed to provide a view on how an integrated information system can give customers the main function of interacting with information through products or services, considering the fact that such data were processed via business processes which used participant information (data). Data can be any type of input about people, products and/or the business process. A business process needs information (data) as well as the technology to store, manage and organise different types of data. Thus, the different meanings of IS suggest that the modelling of business processes can vary or the understanding of the business process can be different.
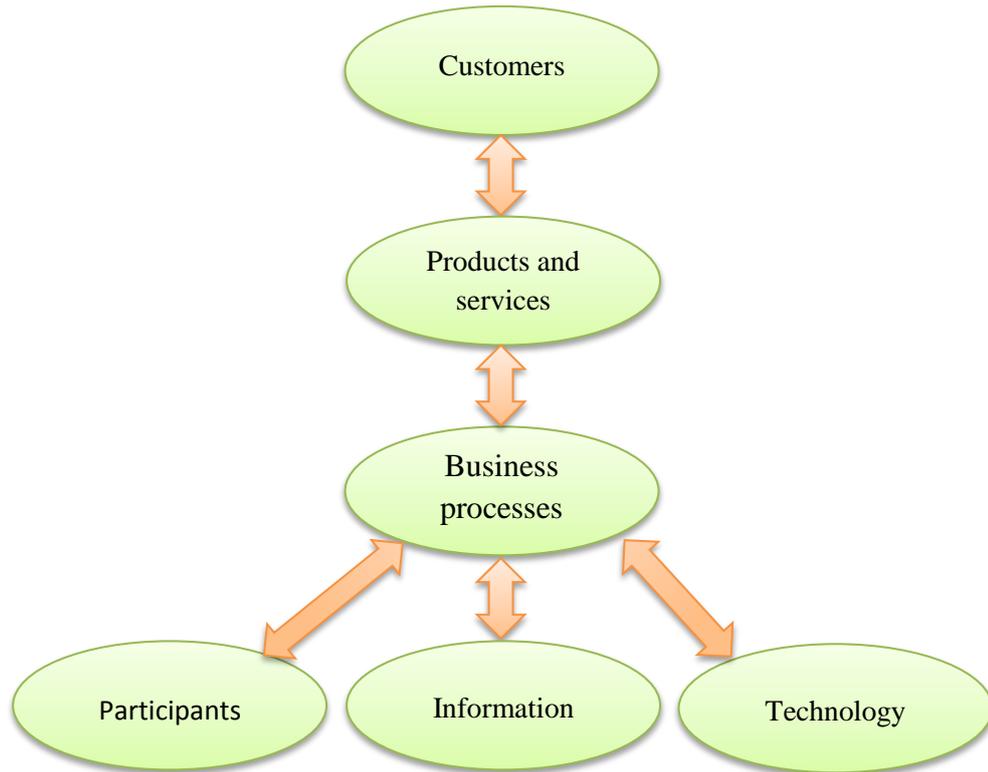
Figure 2.4: An integrated view of an information system, adapted from Alter (2002)

In the same vein, (Brynjolfsson, et al., 1998; Anderson, C. 2012, as cited in Bourgeois, 2014) noted that an IS should have three dimensions and all three must work together to enable the implementation of IS, as shown in Figure 2.5 below.

People – to help support decision making, coordination, control, analysis, and visualization in an organization

Information system's dimensions

Process – collects, processes, stores, and disseminates information

Technology – hardware, software, and networks that support the business processes and people
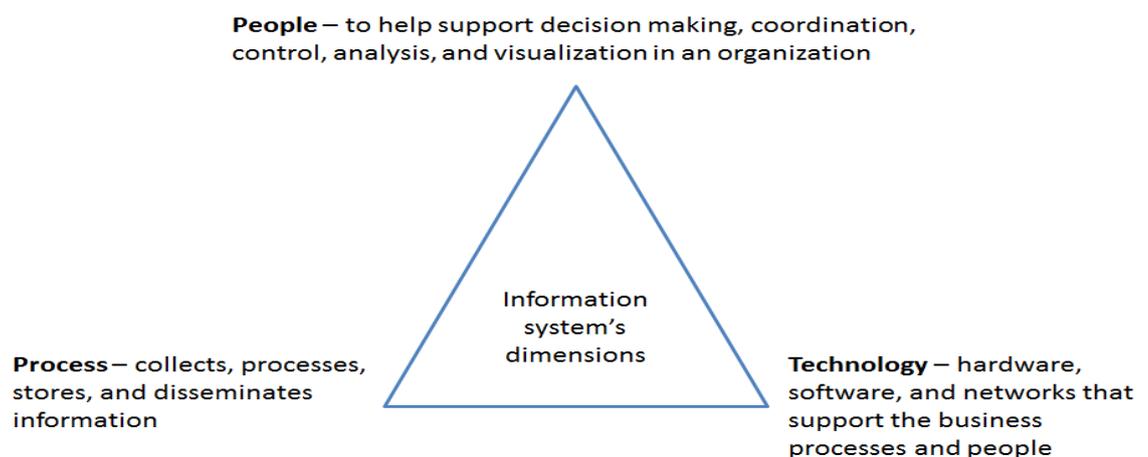
Figure 2.5: Information system dimensions, adapted from Bourgeois (2014)

As can be seen from the previous literature, the customer is always a main player in any IS process in business. This brings to light how IS could be understood from the

perspective of ERP. As a result of the literature review, it was found that a number of different definitions of IS exist in the IS literature. The present research accepts a definition of IS that views such systems as fundamental to what constitutes an ERP system. An IS can be defined as:

"*A set of interacting artefacts and human activities that perform one or more functions involving the handling of data and information, including data collection, creation, editing, processing and storage; and information selection, filtering, aggregation, presentation and use*" (Olson & Kesharwani, 2010, p. 9).

The above definition, supported by two other studies (O'Brien 2004; O'Brien & Marakas, 2007), identifies five activities that IS are primarily intended to accomplish: inputting data; processing data; generating output as information; sorting data; and finally facilitating the control of system performance via the use of feedback mechanisms. In addition, in order to carry out the above activities, IS consists of five components: people; hardware; software; data; and networks to perform input, processing, output and control actions (O'Brien, 2004; Chang & King, 2005). Since people are considered to be one of the IS components, this means that IS failure is not simply technical but can also be caused by many factors in which human error is involved.

According to Bourgeois (2014), for people to understand the meanings of IS they need first to identify its components, including hardware, software, data, people and processes. Once these components are identified, there is a need to understand how these components work together and what kind of values or benefits IS would bring to the organisation. Bourgeois (2014) identified different examples of IS which operate in organisations, as listed in Table 2.2 below.

Table 2.2: Types and descriptions of IS identified by Bourgeois (2014)

Type of system	Description
Point-of-Sale (POS) system	The data is recorded when merchandise is sold. Data is integrated with an inventory database, so more merchandise can be ordered.
Employee hiring system	A web-based system allows for the following: 1- Posting job opportunities 2- Processing of online applications. 3- Hiring systems using digital keywords from online applications.
Sales dashboard	Revenue earnings system to compare the latest number of new leads generated the top five products, sales per rep and regional sales.
Any professional team	Team-working system to enhance communication.
Online education: "Take the world's best courses, online, for free"	Virtual environments include video and images as data.
SAP system	Integrated enterprise-wide information systems that handle procurement, manufacturing, marketing, sales, employee benefits, accounting, finance… and just about every other business function you can think of.
Healthcare system	System includes information about health and insurance.
Geographic information system	Includes data about mapping, traffic reporting and routing to avoid traffic
Sonograms (e.g. seeing a foetus inside the mother's womb)	Image management, reporting and consultation software for ultrasounds.

Bourgeois' (2014) understanding of IS can bring to light the issue of IS functionality. The functionality of IS is very much related to its capacity to generate information for

clients that helps in effective decision making, by accurately reflecting the financial strengths and weaknesses of an organisation. Thus, the use of IS drives better decision-making and optimises performance in everything from customers, products, suppliers and even procedural management (Avison & Fitzgerald, 2003). Moreover, it has been used to improve business processes by automating business steps, increasing business efficiency (by changing the flow of information), or even changing business models regarding the way an organisation works (Laudon & Laudon, 2013). Furthermore, because IS is seen to involve integrated functions resulting from the interactions between people, data, processes, communications and information technology to support and improve day-to-day operations in a business, as well as supporting the problem-solving and decision-making needs of management and users, the purpose of IS should be identified by the organisation before making the decision to adopt it.

Anthony's triangle is identified in the literature as one of the most common frameworks for the classification of IS. According to Ho (2015), the framework has been used by different researchers, including Laudon and Laudon (2004; Chapter 2), Neumann (1994; Chapter 2) and Lucey (1997; Chapters 15–16) and Bourgeois (2014). According to Prezi.com (2013), the Anthony triangle framework (Figure 2.6) provides "*a hierarchical view of information needs*". It is a convenient approach for categorising and understanding the purpose of different information systems in organisations.
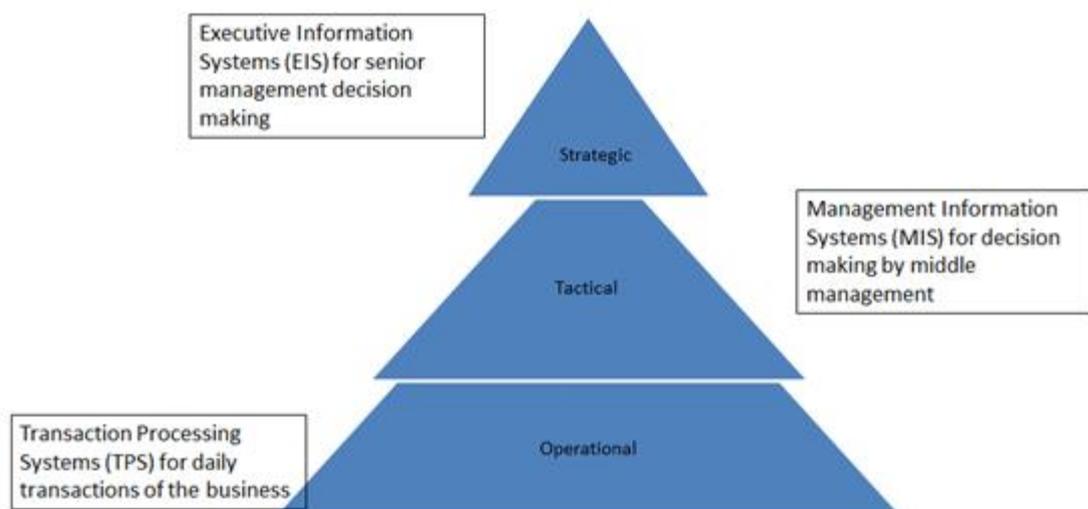
Figure 2.6: Anthony's triangle framework

Furthermore, when a business also thinks about the functionality of IS, then the question which should be asked is, "Can IS bring a competitive advantage or at least stability into the business?" A similar question has been asked by many business owners.

Nicholas Carr (2003) wrote an article in the Harvard Business Review that questioned a similar assumption. His article, entitled "IT Doesn't Matter", insisted that business organisations which see IS as a product fail to understand the actual meaning of IS, which should be seen as an investment that will make organisations stand out. Therefore, IS should be managed to reduce expenses; it should be always maintained, and be as risk-free as possible.

In terms of the possible benefit of IS in organisations, many have implemented it at different levels and functions in order to: (a) improve decision-making through better access and sharing of information; (b) increase operational excellence; (c) speed up daily activities undertaken; and (d) increase the overall competitive advantage attained (Laudon & Laudon, 2004). As companies expand and systems are automated, IS can provide the necessary information to allow management to develop an accurate picture of how a large company operates.

2.3 IS in HEIs

Universities began using IS/IT systems by embracing the same information technology which had earlier been adopted by industry and other sectors (including health care, hospitals, banking and manufacturing), in which different departments shared data on the same organisation's activities (such as accounting, human resources and finance). Many researchers have attempted to identify the differences and similarities between higher education and other organisational sectors. For example, Pollock and Cronford (2004) pointed out that, while universities and manufacturing organisations share some similarities, nevertheless universities have their own unique requirements and specific needs. Pollock and Cornford (2004) also suggested that, while there are similarities between HEIs and other organisations, their use of technology tends to be quite different. Addressing the question of Portuguese ISs in greater detail, Coimbra and Silva (2012) identified what they see as the key similarities and differences between IS in business and IS in higher education. They argued that there tends to be a lack of research into HEIs when ISs are considered, even though many HEIs currently have their own IS and IT systems. They proposed using an architecture first developed more

generally by Anthony (1965) as a tool to classify all possible HEI systems, and to address the particular needs and requirements of individual HEIs. Figure 2.7 illustrates how this classification was expanded to encompass various characteristics.
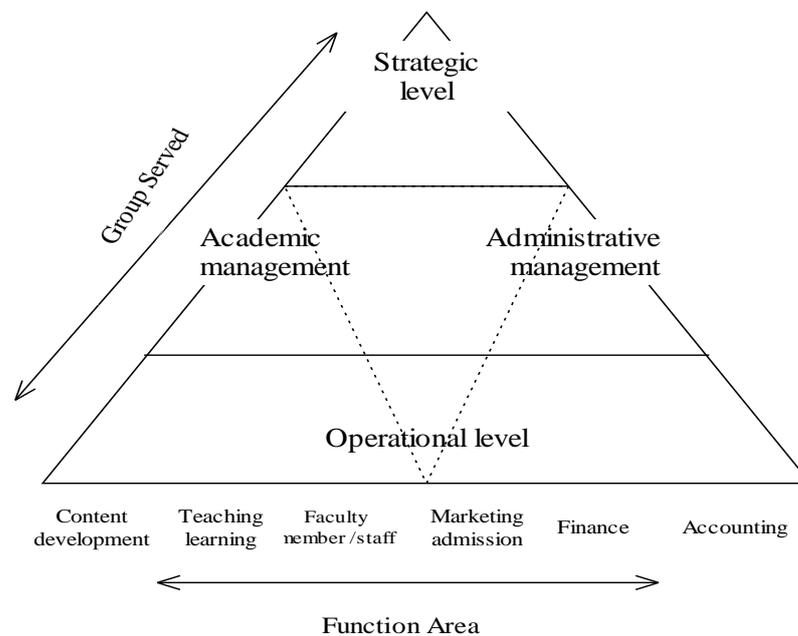
Figure 2.7: Architecture for IS in HEI, adapted from Anthony (1965)

Oblinger (2000) presented the situation slightly differently, substituting functional areas of manufacturing, human resources, and sales and marketing with, respectively, content development, teaching and learning, faculty members and staff, and marketing and admissions. In addition, he subdivided the management level into academic and administrative management, noting that these two groups are in charge of different operational areas (Santos, 1997).

By way of further explanation, Table 2.3 provides an overview of the types of IS used in HEIs, as well as their characteristics and examples.

Table 2.3: Types of IS used in HEIs, adapted from Coimbra & Silva (2012)

information system type	Description	Examples
Operational systems to support normal administrative daily HEI specific activities	Administrative systems used mainly by staff to operate daily functions HEI specific activities.	Student management systems , student financial aid
Operational systems to support normal administrative daily typic organizational activities.	Administrative systems used mainly by staff to operate daily typical organizational activities.	Human resources systems financial systems
Operational systems to support management of teaching and learning content	Systems used by faculty members, or staff to classify and save teaching and learning content.	Learning content Management systems
Operational systems to support delivery of Teaching and learning content	Systems used by students and faculty members to access teaching and learning content	E-learning , E- amassment
Administrative management systems	Systems used by senior staff to monitoring and controlling resource usage	Administrative decision support systems
Academic management systems	Systems used by senior faculty members for monitoring, controlling, and planning curriculums, and to do faculty members' evaluation	Academic decision support systems
Strategic level systems	Help senior management tackle and address strategic issue and long-term trends both in the HEI and in the external environment.	Executive support systems
Generic systems	Systems used by distinct users from distinct groups	Office tools , parking control systems , traditional library systems
Transversal systems	Systems that have users from distinct groups and have integration purposes	Portal Document work flow
Integrators	Systems which users are others systems and have integration purposes.	Message broker User directory

From Table 2.3 above, it can be observed that there are many elements in the structure of university systems which open up the possibility of thinking about implementing an ERP. For example, in terms of the strategic level element, it can be seen from the description that the senior management team has control over strategic issues in both the HEI and the external environment, which in turn means there are different levels of control which can facilitate the implementation of an ERP system.

In recent years, with the rapid proliferation of technology, HEIs have started to address such issues, sometimes turning to ERP systems to meet their needs. They have sought to replace their disparate and outmoded systems with an integrated system that uses a

single database and is accessible for end users from different departments, and is used for automated processes across different functions, connecting all concerned parties. In addition, it provides the tools for standard analytical reporting that can help improve performance to the satisfaction of all stakeholders. The question of how ERPs can be adapted to fit such a complex environment will be addressed in the following sections.

2.4 IS in Saudi Arabia

Among the countries constituting the Arab world, Saudi Arabia is one of the largest. King Saud University was the first to be established in the capital city of Saudi Arabia, Riyadh, in 1957. Subsequently, other HEIs were established throughout the country, the total number of public and private universities at present being 25 and 21, respectively. Of these, many are represented in various regions of Saudi Arabia by subsidiary institutions (Jamjoom, 2012).

In the past, many Saudi universities used traditional systems both for their administrative and academic services. For teaching and learning processes, for example, students would attend lectures with physical materials or textbooks. For administrative functions, universities would rely on a paper-based system, manually managing information between different levels of the university. At a department level, the amount of information has grown at an exponential rate in many universities, because of the growth of individual departments and because of the fact that more students are attending university than ever before. Through their use of this slow and labour-intensive manual process, universities face the challenge of how to share information, a process occurring between departments which can be extremely cumbersome and can lead to less interdepartmental collaboration as a result. Consequently, it becomes difficult to access information from outside a department. Moreover, manual systems such as paper documents can be easily misplaced or damaged and can be inaccurate; they also tend to be inefficient to produce.

At the university level, the lack of a common repository resulting from the use of manual ISs raises a number of issues, including the following: (a) the administration has little control over document retention, which can be problematic for compliance with record-management laws; (b) even the quality of students recruited suffers, as the university is unable to identify and segment high-value applicants quickly for immediate follow-up (Alfahad, 2012).

In light of the above discussion, university staff members at a range of levels within the institution face increasing numbers of students, enrolled in a growing number of departments, while generating different types of information in a complex environment, which would be difficult to handle by manual processing alone. As a result, IT companies have expanded their IS services to meet higher education requirements, supporting and managing information for managers and decision-makers, as well as enhancing the learning and teaching process. As noted previously in Section 2.3, IT refers to the technological side of ISs. However, in HEIs, it can also refer to integrated computers, software applications, multimedia content (video conferencing, television, speakers, the internet, web-based systems, learning management systems and other tools that can be used to improve the teaching and learning process (Alfahad, 2012). The impact of IS/IT in HEI is varied and is of primary importance in giving greater flexibility to the learning environment, as well as providing greater efficiency to management services, speeding up processes, and creating competition in communication services, thus helping to increase competitive advantage (Guha, 2003; Alfahad, 2012). Brown (2000) described this transformation from manual systems to CBIS as the "digital shift". It involves a conversion to digital and informational forms of knowledge, communication and thinking for individuals. HEIs could employ this as an innovative set of IT skills, which could come to determine whether the introduction of IS is a success or a failure in any organisation.

In accordance with national policy regarding the use of IT in all sectors, decision-makers in Saudi Arabia have put a great deal of emphasis on the maximum usage of ICT. As mentioned previously in Section 1.2, the 9th Economic Social Development Plan urged a shift to electronic operating systems in order to keep in line with the accelerated growth of IS in the current competitive environment. Furthermore, to enhance the general performance of educational institutions and to meet the established educational objectives, the government has supplied these institutions with cutting-edge scientific and technological equipment. Due to the high level of IT investment, Saudi Arabia is now the largest IT market in the Persian Gulf region (Communications and Information Technology Commission, 2010). The sectors in which large-scale IT projects were initiated include employment, education, smart cities, healthcare and transport. Additionally, in 2010, there was a 14% increase from the per capita IT expenditure of 2009, reaching a total value of approximately $266 billion.

There are significant differences between public and private universities in Saudi Arabia, in terms of their nature and structure. The government funds and manages public HEIs, therefore education is free of charge and students are granted a monthly allowance as well. By contrast, private HEIs have tuition fees and, according to the legislation promulgated by the Ministry of Higher Education, they must be non-profit and affiliated to a charitable organisation (Ministry of Higher Education, Private Colleges List, 2012). Apart from King Abdullah University of Science and Technology and King Fahd University of Petroleum, all private and public HEIs practise gender segregation.

An understanding of the situation in Saudi Arabia may be gleaned from the limited number of studies that have investigated the matter of ISs in other countries in the Arab world. However, despite certain cultural similarities, the application of the findings of these studies to the context of Saudi Arabia is challenging, due to the fact that gender segregation does not occur in other Arab countries. In addition, the oil-rich countries of the Gulf region are not confronted with the same obstacles, such as the unavailability of equipment or infrastructure, that affect numerous Arab countries considered to be less developed (Wee & Abu Bakar, 2006). As Saudi Arabia is the leading global oil exporter, its government can afford to allot significant funds to education, and to HEIs in particular. Given that the implementation of IS in Saudi HEIs is not circumscribed by resource insufficiency or monetary considerations; it can be argued that the primary obstacles hindering IS development are of a cultural and organisational nature.

The dominant culture in Saudi society is Arabic and Islamic, and this is reflected in all Saudi HEIs, whether public or private (Hamdan, 2005). This means that working conditions throughout the country are highly affected by the implications of such gender divisions for example, even those Saudi universities which are nominally mixed have separate departments for males and females. This means that, although universities are generally considered to be large organisations, those in Saudi Arabia can be considered to be much more complex, because of the influence of the prevailing societal culture. Therefore, the adoption of IS in Saudi Arabia faces a range of issues that tend to hinder the adoption of technological (and other) innovations generally. Various cultural and management factors, such as user resistance, lack of top management support and users' lack of training, need to be resolved before the effective implementation of an IS can be achieved. It can be argued, however, that budgetary constraints and a lack of resources

are not generally seen as barriers for IS exploitation in Saudi HEIs, which suggests that cultural and organisational issues are the more significant barriers to IS development.

In spite of the huge effort made by this researcher to explore the nature of IS adoption and use in Saudi universities, it was hard to avoid the conclusion that very few studies have been published to date that present a clear or full picture of how Saudi universities are adopting IS. It is therefore proposed that some original research exploring the situation in greater detail would offer a significant extension of our understanding of IS in the context of Saudi HEIs. Coimbra and Silva (2004) report that the benefits of implementing new technology through particular systems can be driven by the need to resolve existing problems. Therefore, this researcher has attempted to address this issue by modifying the Coimbra and Silva model (2004). Figure 2.8 illustrates the levels of organisational and functional areas of IS in such a Saudi system, to help explain both the organisational structure and the nature of the IS itself and its use in Saudi universities.
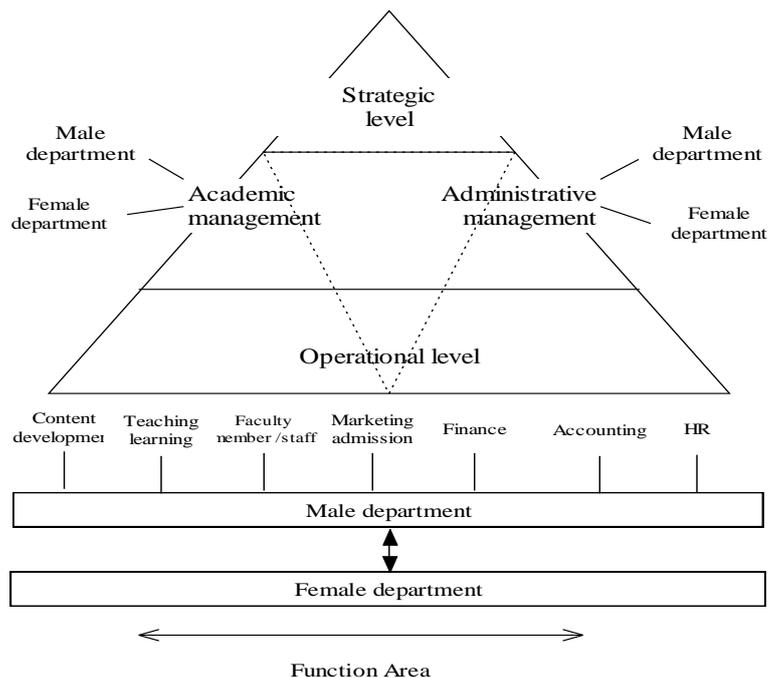
Figure 2.8: Levels of organisational and functional areas of IS in Saudi universities, developed by the researcher

Figure 2.8 above helps illustrate the uniqueness of the Saudi university structure, including its gender segregation and how it functions; the levels are shared between both male and female branches. In Section 2.4 above, the figure has been developed to

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extend it to the context of HEIs, dividing it accordingly into two different management sectors (administrative and academic), each of which in turn is subdivided into male and female divisions, with the male department having responsibility for male staff/students and the female department having responsibility for the female branch. However, the female department also receives instructions from the male department, which effectively means that the real power and authority lies with the male department. This is an added complication to the decision-making process and applies to many different ISs within HEI functions. Each IS needs to be implemented in both male and female departments in a way that enables staff to share documents in the same function area. For example, the teaching and learning system can be shared by both departments, since academic staff from the male departments are able to make presentations to their colleagues in female departments, even without meeting face-to-face, through the use of conference video lectures. This in turn means that men and women are segregated in the workplace, but do not have separate functions, as they are able to exchange resources when both male and female departments share a single function.

This gives some idea of how ISs are implemented in such a complex environment. Various cultural and management factors need to be settled before initiating the adoption of any new system, along with an idea of how this environment might be managed. Because of these segregated departments, Saudi HEIs can be considered as particularly complex environments, with an additional layer of complexity to most of their counterparts. All of these challenges put particular demands on ERPs, which are designed to integrate different departments in large organisations. Precisely because of this flexibility and smoothness of integration, many Saudi HEIs have adopted ERPs, and such systems are gaining influence in universities that are seeking to develop and re-engineer their administrative systems as a route to improved performance (King, 2002; Abugabah & Sanzogni, 2010).

After obtaining a comprehensive understanding on IS in general, the next section provides a general detailed overview on more specific phenomena about ERPs.

2.5 ERP conceptions and meanings

When it comes to understanding what ERP is and how it functions, a comprehensive body of literature can be reviewed. In an early understanding of ERP, Davenport (1998) perceived the heart of an ERP as a single central database that draws data from, and feeds data into, a series of applications supporting diverse company functions, thereby

dramatically streamlining the flow of information throughout the company as shown in Figure 2.9.
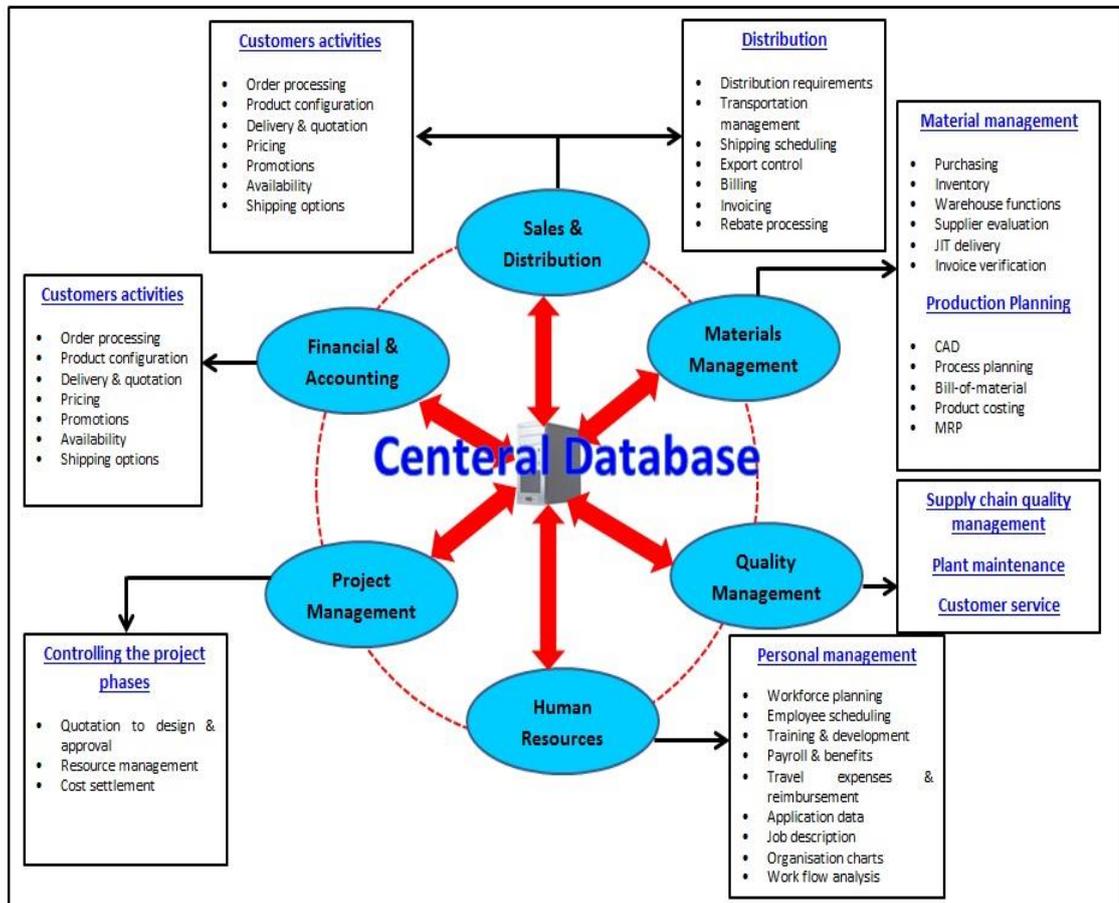
Figure 2.9: Anatomy of an Enterprise System, adapted from Davenport (1998; as cited in Al-Braithen, 2011)

Fowler and Gilfillan (2003) stressed that ERP is an IS solution that integrates data from all functional areas into one real-time database, to enable different departments in an organisation to conveniently share information (Rerup Schlichter & Kraemmergaard, 2010). They added that ERP systems are software used to distribute information throughout the organisation. From the perspective of Monk and Wagner (2009), although ERP is a type of software which can be used by companies to coordinate information in every area of the business, ERP is used to manage company-wide business processes, using a common database and shared management reporting tools. They further explain that 'business processes' themselves are essentially a collection of

activities that receive inputs and create outputs, such as business reports or forecasts, that are of value to the customer (Monk & Wagner, 2009).

Consequently, in practice, ERP software aims to enhance the efficiency of business processes through the integration of different business tasks relating to areas such as accounting, logistics, manufacturing, marketing, sales and staffing (Monk & Wagner, 2009). In actuality, companies that manufacture goods typically have four main functional areas of operation: (a) *marketing and sales* (e.g. customer relationship management (CRM), customer support, sales forecasting); (b) *production and materials management* (e.g. manufacturing, logistics, maintenance); (c) *accounting and finance* (e.g. budgeting, cost allocation and control); and (d) *human resources* (e.g. recruitment, training, payroll) (Brady, Cronin, & Brand, 2001, p.2). However, whereas traditionally business functions were separated, Brady et al. (2001) remarked that, alternatively, "*thinking in terms of business processes helps managers to look at their organization from the customer's perspective*" (p. 2). This means that, if the IS for each business function is integrated, overall business processes can be streamlined and become more efficient and better for the customer.

In the most current research on ERPs, it was understood that an IT/IS solution (software) which aims to integrate business functions and data processes into a single system to be shared within an organisation. This was extended after the 1990s to cover "back offices", including human resources and planning for production (Ross, 2007; Van Nieuwenhuyse, De Boeck, Lambrecht, & Vandaele, 2011). From another perspective, (Swartz & Orgill, 2001 as citied in Abbas ,2011) said that ERP can become more competitive if it is extended to supply-chain management and customer relationship management, as shown in Figure 2.10 below.

Figure 2.10: New understanding of ERP extension, adapted from Abbas (2011)

Nwankpa, Roumani, Brandyberry, Guiffrida, Hu and Shanker, (2013) understood ERP as systems which include platform technologies that permit the adoption of subsequent technologies that leverage the information integration created by an ERP system. They added that such ERP systems are used to rationalise business processes and "*integrate hitherto disparate applications across functional areas of businesses into an integrated information system platform*" (p. 18). This definition supports Ross (2006) definition of ERP, which stated that "*ERP is a business management system that encompasses integrated sets of comprehensive software, which can be used to manage and integrate all the business functions within an organisation with a rationalised data architecture, characterised by core process integration and shared product and/or customer databases*" (p. 12). These definitions seem to suggest the creation of a new era of ERP development because it has been understood as software or an IT/IS solution; however, the understanding has been extended to become a system which can be used to manage increasingly complex operations (Seo, 2013).

2.5.1. Development of ERP

Speaking about the development of ERP, Atkinson (2013) stated that ERP evolved from the introduction of computer systems to businesses, so that they could be used by employees to perform their work more quickly and accurately. Atkinson (2013) added that ERP came about as a result of the introduction of computer systems that could be utilised by employees to perform functions much faster and more accurately across a broad range of areas within the organisation.

Many authors (Rashid, Hossain & Patrick, 2002; Kerimoglu & Basoglu, 2006; Olson & Kesharvwani, 2010; Atkinson, 2013) pointed out that the historical development of the ERP system began in the 1960s as an Inventory Control Package to control the supply chain, as shown in Figure 2.11. During the 1960s and 1970s this technology was called 'materials requirements planning' (MRP), as it had primarily developed within the manufacturing industry. However, it was improved upon during the 1970s through the introduction of a 'Master Production Schedule' into the system, which allowed the sequencing of steps required to build products, as well as specific timeframes for the production of required materials. As the MRP system developed further, other improvements were made, such as "*the linking of sales order entry, detailed finite capacity planning, product costing, finance, maintenance, dispatch, and invoicing into*

an integrated set of modules that provided real-time management decision support information" (Atkinson, 2013). Nevertheless, the implementation of the new Manufacturing Resource Planning (MRPII) was hindered in practice by a lack of investment in training and education of employees, and, although in the 1990s it was relabelled as ERP, these implementation problems remained (Atkinson, 2013).

As ERP systems evolved, they were rolled out to other business sectors, apart from manufacturing and hospitals; and there was increased investment in ERP education and government departments (Olson & Kesharvwani, 2010). According to Olson and Kesharvwani (2010), 70% of fortune firms have or will install ERP systems soon, which will boost the global ERP market from a total value of $15 billion in 2013 to $50 billion over the next five years (Rashid, Hossain & Patrick, 2002; Kerimoglu & Basoglu, 2006; Olson & Kesharvwani, 2010; Atkinson 2013).

1960s Inventory Control Package	1970s Material Requirements Planning	1980s Manufacture Resource Planning	1990s Enterprise Resource Planning (ERP)

2000s Extended ERP system
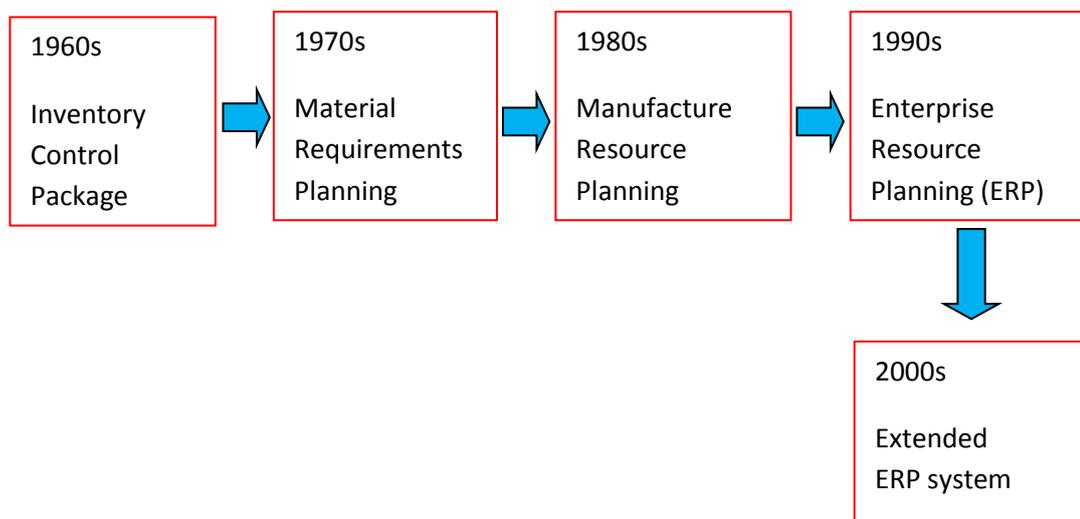
Figure 2.11: The historical development of ERP system since the 1960s

From another perspective, Rerup Schlichter and Kraemmergaard (2010) argued that the development of ERP was not only related to the business interests of ERP but to different areas of concern, which are addressed in Figure 2.12.

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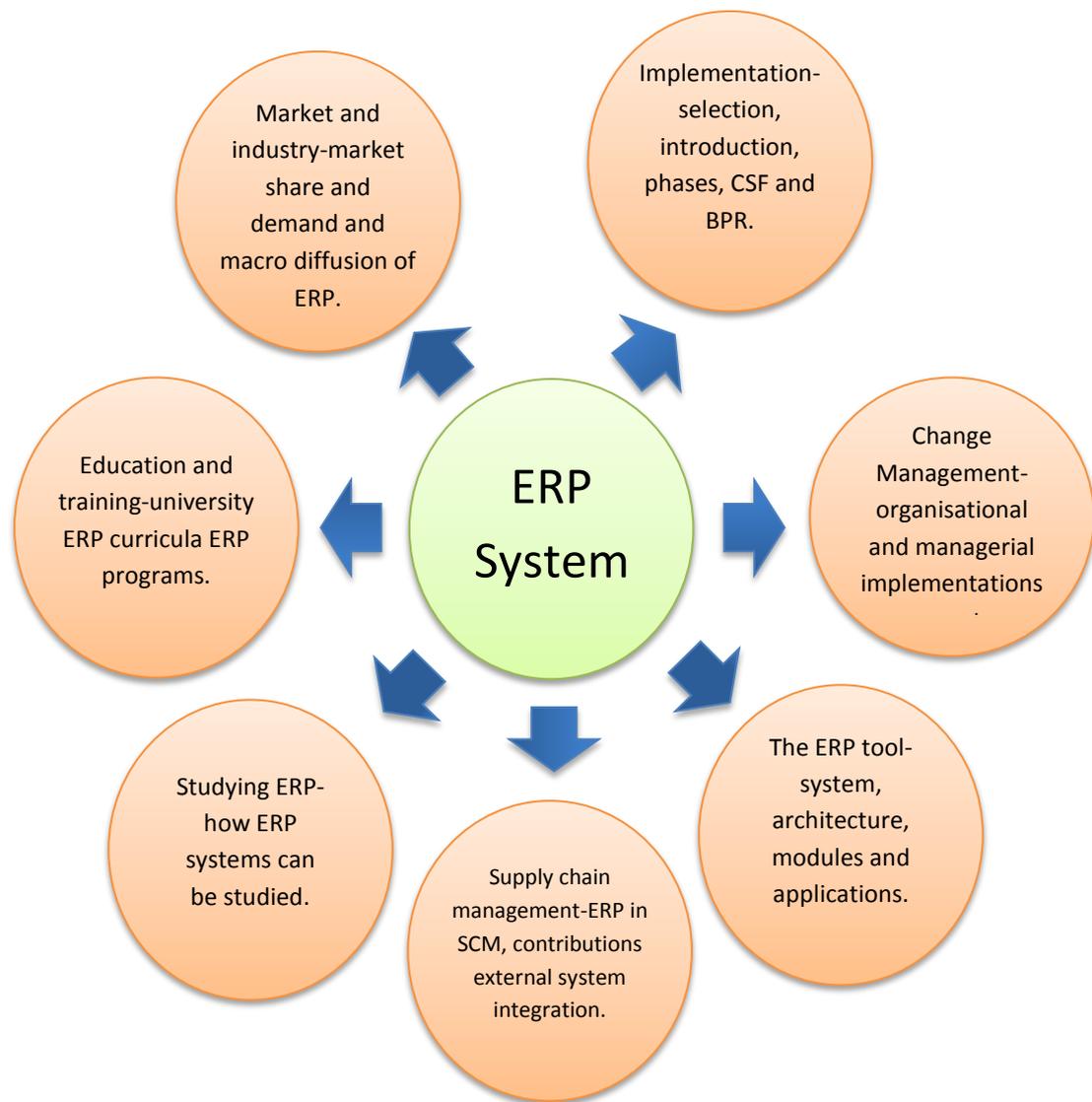
Figure 2.12: Conceptual framework for "areas of concern" regarding ERP systems, adapted from Schlichter & Kraemmergaard (2010)

As can be seen from Figure 2.12, the development of ERP was driven not only by the needs of the business but seven areas of concern contributed to the development of ERP, including different issues such as implementation, post-implementation, organisational change and managerial implications, the ERP market and industry, education and training, supply-chain management and the ERP system itself; these issues have implications for both managers and researchers.

From another angle, Leon (2008) suggested that the development of ERP also tackled the practical area of ERP systems, which has a modular nature. Leon (2008) stated that ERP as a type of software is made up of a number of different 'software modules', with

each mimicking a major functional area of a business. This means that, for instance, ERP modules for a business may include those relating to any or all of the following functions: asset management; control; finance; financial accounting; human resources (HR); inventory control; manufacturing; marketing; materials management; order tracking; plant maintenance; product distribution; production planning; purchasing; quality management; sales and distribution (S&D); supply chain management; and workflow (Leon, 2008). All these modules have specific uses, and it is remarked that the financial modules of ERP systems provide financial functionality support to businesses in the form of balance sheets, general ledgers, trail balances and quarterly financial statements (Leon, 2008).

There are both advantages and disadvantages arising from the use of major modules in ERP systems. Firstly, many businesses leverage the module format in order to select only the most relevant modules within their specifically tailored ERP system. For instance, many of the most popular modules are widely used by a majority of businesses. A study of ERP modules use by Midwestern American manufacturers showed high module use in the following areas: financial and accounting (91.5%); materials management (89.2%); production planning (88.5%); order entry (87.7%); purchasing (86.9%); and financial control (81.5%) (Mabert et al., 2000).

On the other hand, different modules, such as quality management (44.6%), HR (44.6%), maintenance (40.8%) and research and development management (30.8%) were reported as less widely using ERP. The advantage of the modular ERP system is that modules can be chosen that specifically suit a business, and this means the ERP system may be cheaper than a full ERP system which includes all modules. The modular nature of the ERP system also means that the pick-and-choose approach may not actually reflect a fully integrated systems approach to enterprise management. Lehrstuhlfür Wirtschaftsinformatik (2010) stated that ERP modules are developed to communicate with any organisation's own software, with variable degrees of effort, and, depending on the software, ERP modules can be customised via the vendor's proprietary tools, as well as by proprietary or standard programming languages. Noaman and Ahmed (2015) identified the following modules as the most common ERP modules in the market.

Table 2.4: ERP moduls

SAP	Oracle	PeopleSoft	JD Edwards
Sales & Distribution	Marketing, Sales	Supply chain	Order management
Materials Management MRP	Procurement	Supplier relationship	Inventory, procurement
Production Planning MRPII (with others)	Manufacturing		Manufacturing mgmt
Quality Management		Enterprise perform	Technical foundation
Plant Maintenance	Service	Enterprise service	
Human Resources	Human Resources	Human capital mgmt	Workforce management
Financial Accounting	Financials	Financial mgmt solution	Financial management
Controlling			Time & Expense mgmt
Asset Management	Asset Management		Enterprise asset mgmt
Project System	Projects		Project management
Workflow: prompt actions	Order Management		
Industry solutions: best practices	Contracts		Subcontract, real estate

2.5.2 Development of ERP Lifecycle and ERP Lifecycle Models

When we speak about the ERP lifecycle, then we are speaking about different stages which ERP goes through. Esteves and Pastor (1999) proposed the 'Lifecycle Framework' model (Figure 2.13)
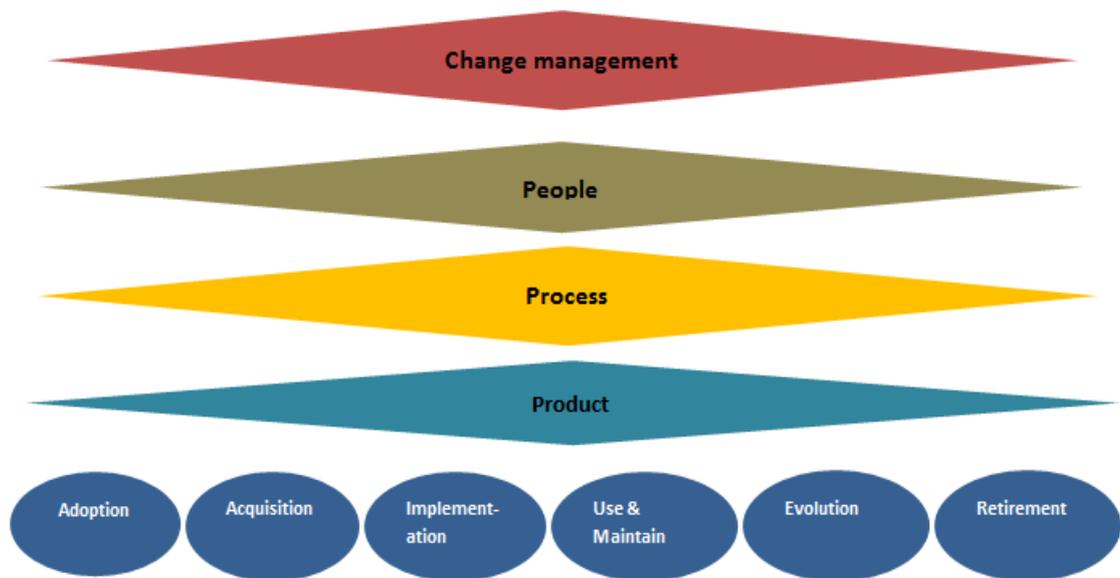
Figure 2.13: ERP Lifecycle Framework, adapted from Esteves and Pastor (1999)

The ERP Lifecycle Framework model was structured in terms of phases and dimensions, with the phases representing different stages of an ERP system and dimensions reflecting different viewpoints by which the phases could be analysed (Esteves & Pastor, 1999). This meant that, in practice, the framework moved from the adoption-decision phase (questioning the need for the ERP system), through to acquisitions, implementation, use and maintenance, evolution and then the retirement phase. The latter was said to correspond to the stage when the appearance of new technologies or the inadequacies of the ERP system or approach would make the existing ERP system redundant (Esteves & Pastor, 1999). Each of these phases could be viewed through the lens of a particular dimension, such as 'people', 'processes', or 'change management'. The model allowed issues relevant to each phase of the ERP system to be identified: for example, issues such as consultant selection, contractual agreement, return on investment and product selection were relevant to the acquisition phase (Esteves & Pastor, 1999).

At the same time, important research undertaken by Markus and Tanis (2000) into enterprise systems revealed them to have several common characteristics, each with important implications for the organisations that adopted them, including: (a) *integration* (i.e. seamless integration of information flowing through a business); (b)

packages (i.e. ERP systems are commercial software packages purchased from software vendors); (c) *best practice* (i.e. ERP systems were designed to support generic business processes leading to their development, reflecting 'best practices' in terms of cross-functional efficiency and effectiveness); (d) *some assembly required* (i.e. further integration of enterprise software is required); and (e) *evolving nature* (i.e. enterprise systems are architecturally changing) (Markus & Tanis, 2000). It is because of these characteristics, common to many enterprise systems, together with the groundwork laid down by Markus and Tanis (2000) that the ERP Lifecycle was eventually capable of being developed, and in turn, these common characteristics significantly affected it. The progenitor ERP Lifecycle took the form of the 'Enterprise System Experience Cycle', proposed by Markus and Tanis (2000), who believed that it afforded the best opportunity for achieving enterprise roll-out success (Figure 2.14).
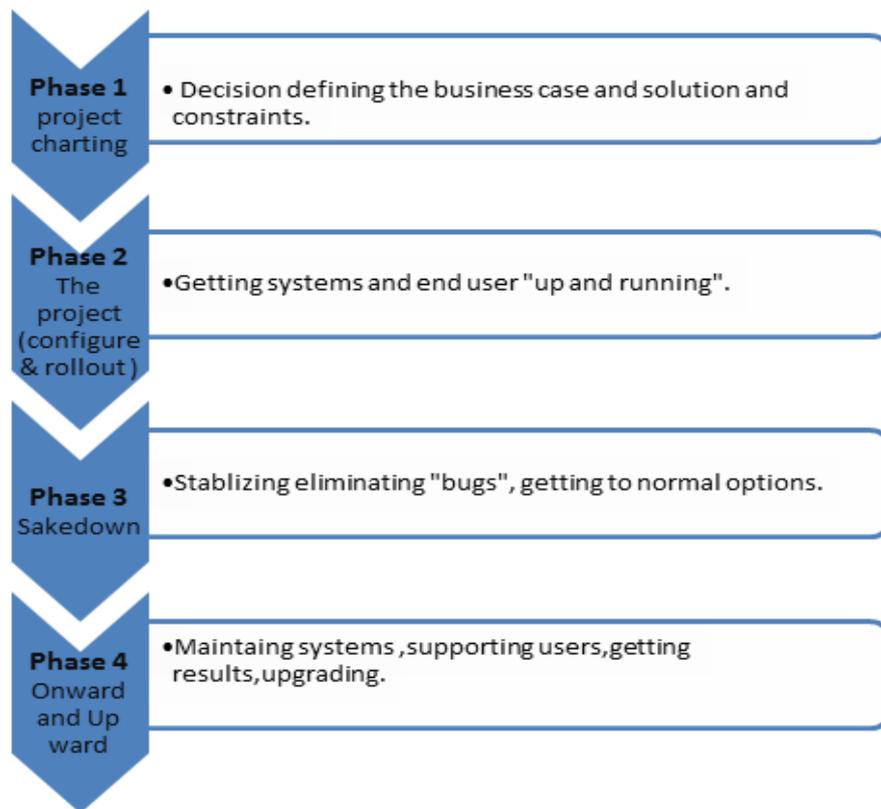
Figure 2.14: Enterprise System Experience Cycle, adapted from Markus and Tanis (2000)

This model was built on further, and integrated, in order to develop a simplified ERP lifecycle, as can be seen in the work undertaken by Haddara and Elragal (2013) (Figure 2.15).

Haddara and Elragal (2013) explained that the adoption phase initiates the ERP process, as companies realise the need for an ERP system to satisfy their business and technical needs, followed by the critical acquisition phase. Following this, the most costly, critical and time-consuming phase is that of implementation, which consists of customising the ERP system; business process re-engineering; data migration; and end-user training (Haddara & Elragal, 2013). The use and maintenance phase touches upon areas such as user acceptance; the evolution phase considers the integration of ERP systems with other systems, such as supply chain management or CRM; and the retirement phase corresponds to the abandonment or substitution of the existing ERP system (Haddara & Elragal, 2013). In practice, it was noted that the evolution and retirement phases had received very little coverage within the ERP literature (Haddara & Elragal, 2013).
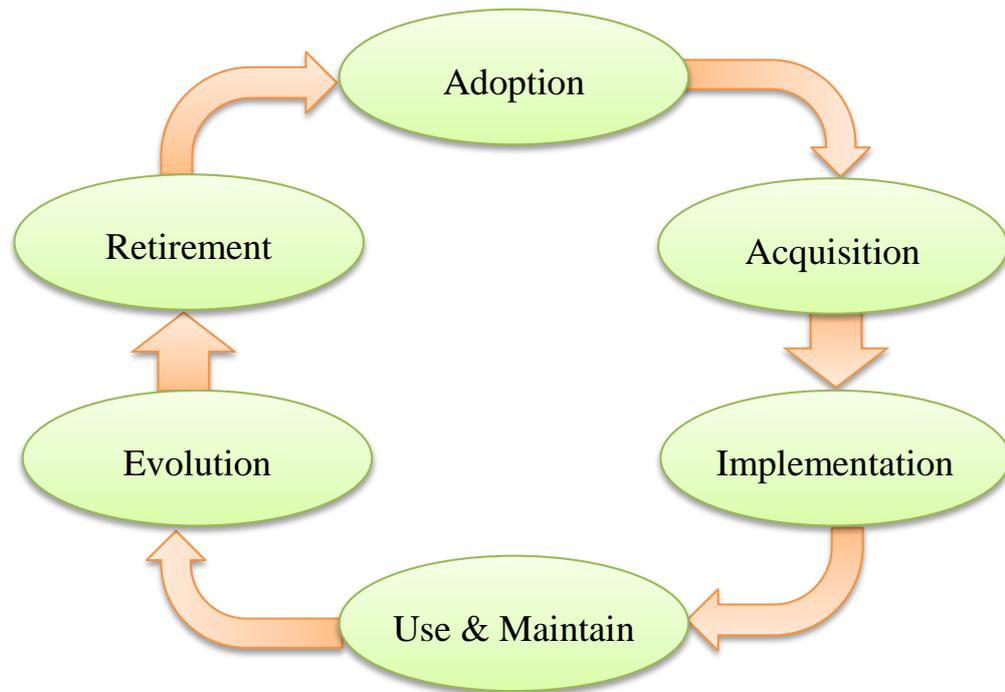
Figure 2.15: The ERP Lifecycle, adapted from Haddara and Elragal (2013)

From another perspective, Ehie and Madsen (2005) suggested that the ERP lifecycle should concern the ERP implementation process. They identified a five-stage ERP implementation process using various reviews of the previous literature, including project preparation, business blueprint, realisation, final preparation, and 'Go Live' and support (see Figure 2.16)
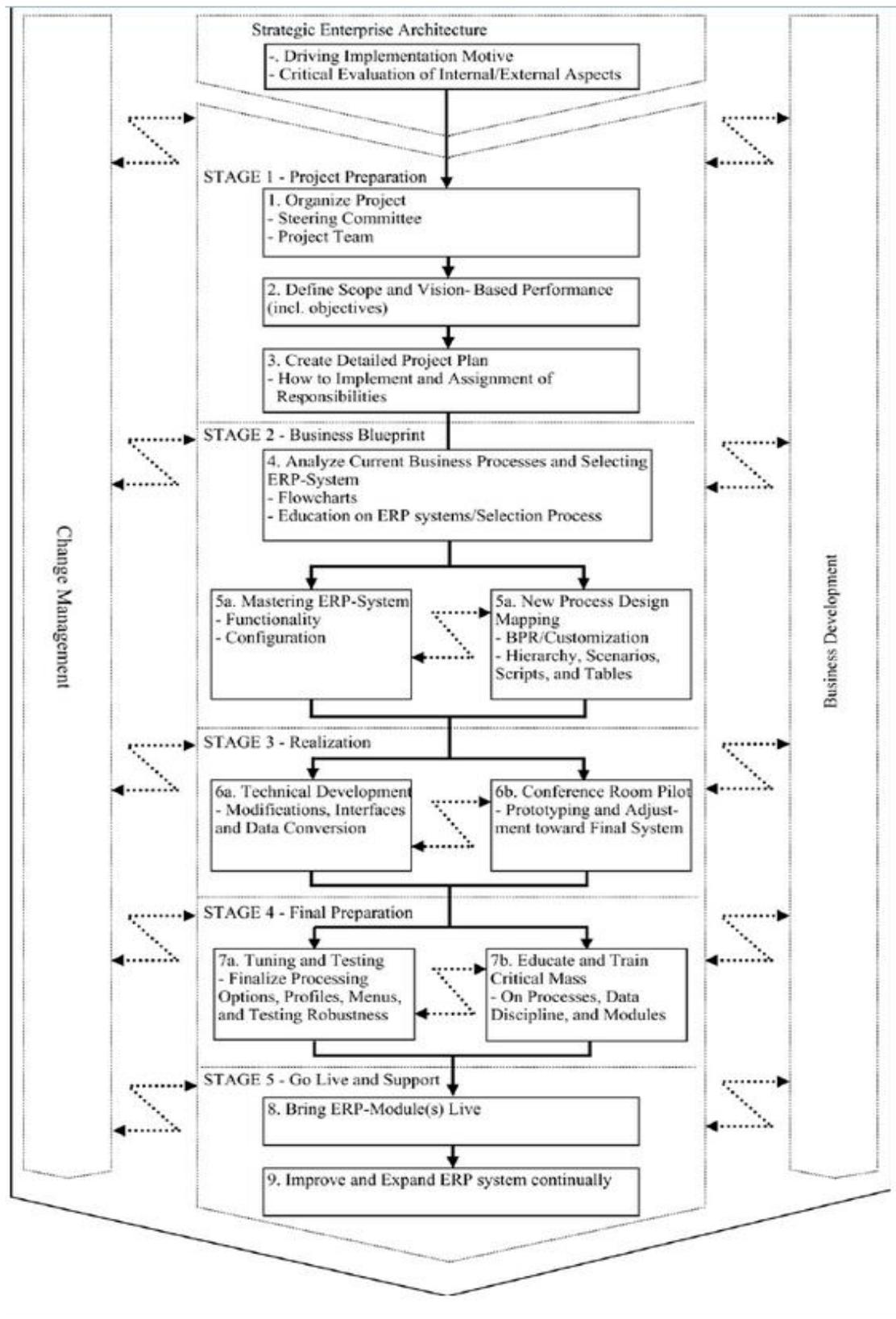
Figure 2.16: Five stages of the ERP implementation process (Ehie & Madsen, 2005)

As can be seen from Figure 2.16, while project preparation involves comprehensive planning activities, which require framing a project team with leadership roles, setting

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budget targets, and defining the project objectives and plan, the business blueprint phase helps one to understand the current business process in detail in order to select an appropriate ERP system. It requires education and training. At the realisation stage, technical development should start and further adjustment and prototyping towards the final system addressed. At the fourth stage, the process moves towards final preparation, which involves further education and training until all is ready for the final 'Go Live' stage, where extra and continuance support is needed.

2.6 ERP in the HEI context

As has been addressed earlier in Section 2.5, one of the core aims of ERP systems is to integrate a number of different IS functions into a single centralised database, thereby streamlining data access across the organisation and increasing organisational efficiency and productivity in the long run. Nevertheless, the high implementation, maintenance and upgrading costs of modern ERP systems means that they are sometimes not suitable for smaller enterprises, whereas in contrast larger corporations, which can afford modern ERP systems and successfully implement them, will reap significant cost savings and enhancements in the long run, i.e. a positive cost-benefit analysis. Abugabah and Sanzogni (2010) stated that HEIs have spent more than $5 billion on ERP investment during the last few years, which motivated many vendors to expand their ERP product scope to include new products in response to relatively new market needs. Abugabah and Sanzogni (2010) added that universities have adopted ERP systems in order to achieve more development and re-engineer administrative systems, in order to improve productivity and performance. According to Kassel (2009), UNISCO reports that software vendors believe that the education market is a growing market and can be a lucrative "industry", potentially able to bring several hundred billion dollars into their revenues. The current literature indicates that HEIs are following business organisations in their ERP modules, such as HR and Finance. Furthermore, ERP vendors provide student registration management module to serve more HEI needs (Noaman & Ahmed (2015).

The widely-noted success of ERP systems in modern corporations has meant that HEIs have begun to be drawn to their benefits. Ansen (2014) stated that ERP implementation started to grow because of the increasing need to automate business processes. Nevertheless, in HEIs it has been noted that, in recent years, billions of dollars have been invested in ERP systems, but in a large majority of cases ERP implementation has failed to meet expectations (Mehlinger, 2006; Abugabah & Sanzogni, 2010).

It has therefore been argued by Seo (2013) that HEIs have been subjected to decreasing government funding, increased stakeholder expectations, and a need for greater integration of management systems to manage increasingly complex operations. This means that universities are under a great deal of pressure to deliver higher quality educational services at lower costs; and since this is exactly what ERP systems can do, and because there have been numerous ERP successes, universities have sought to implement new ERP systems (Seo, 2013). Seo (2013) argued that the problem in practice has been that specially designed educational ERP products or modules (e.g. student lifecycle management software from Oracle or SAP) have not been extensively tested, and that increased customisation options run a higher risk of ERP implementation failure (e.g., by expanding the scope of work and costs) (Seo, 2013). This viewpoint was also supported by Noaman and Ahmed (2015), who stated that the lack of ERP functionality in HEIs occurred due to the fact that there is no specific ERP vendor in this market, which increased the lack of fit between ERP systems and universities.

Since HEIs often have specialised structures in place, as colleges and departments are divided into different academic and professional disciplines (e.g. Law, Arts, Sciences and Engineering), this means that the decision-making processes are different from those in traditional hierarchical structures in corporations (Seo, 2013). Lockwood and Davies (1985) list the similarities and differences between universities and business organisations, which include complexity of purpose; structure and diffusion of authority; internal fragmentation; and diverse multi-user involvement, all of which can increase the challenges of responding to all of the different departments' and stakeholders' goals and cultures.

However, after a systematic review of the ERP literature, it was found that there is a lack of research indicating the potential identifications and characteristics that allow for differentiation between university contexts and business organisation environments, and that there is no consensus in the literature to suggest that HEIs have sufficient significant characteristics to warrant them being considered as unique when compared to business organisations (Noaman & Ahmed, 2015). Some researchers have identified certain areas of differentiation, such as the operational issues that arise when the vendor tries to force-fit the student role into a general ERP human resource design that was structured for an employee or customer (Pollock & Cornford, 2004). From another perspective, Fowler and Gilfillan (2003) illustrated that the traditional committee

decision-making culture of large universities is another unique characteristic of the university, which can bring many challenges to ERP projects. Seo (2013) agreed with Fowler and Gilfillan (2003) that HEIs and business organisations experience different challenges when it comes to the implementation of ERP in relation to organisational structure and cultural ERP implementation in HEIs compared to business organisations; the unique structure of HEIs makes the decision-making and re-engineering processes more complicated in HEIs. In this sense, change management and consultants play a significant role in the implementation of ERP in HEIs. Also, it was found that HEIs encountered difficulties in their communications plans throughout the ERP project.

Therefore, the researcher suggests that, before deploying ERP in HEIs, there is a need to understand the context of such organisations because HEI environments and requirements are different to the business environment. However, Seo's study did not deeply investigate the difference in terms of understanding ERP functionalities and how management and governmental policies and national culture could impact on ERP systems in HEIs, in a way that can assist the universities to consider these issues in relation to their ERP project, as well as giving the vendor an understanding of the complexity of ERP implementation from different perspectives. Noaman and Ahmed (2015) stated that nowadays vendors have a better understanding of the needs of ERP in HEIs than was previously the case, due to increased competition and faster development of ERP projects, which in turn present many seemingly never-ending challenges for organisations in terms of keeping their systems up-to-date.

Nonetheless, research specific to the higher education experience has not followed IS developments at the same rate as business organisations (Sullivan, 2009). It is only in the past 15 years that ERP higher education research has begun to appear in the IS literature. In a survey of 238 ERP research papers published from 2000 to 2007, less than ten were focused on academic ERP systems (Dery et al., 2006; Moon 2007). Corresponding to the significant number of the highest 57 educational institutions adopting ERP systems (Sullivan, 2009), a comprehensive review of the literature found continuing growth in the last decade (2006–2016), and identified the issues which might influence perceptions of ERP in HEIs, as follows:

- A set of benefits which drive the adoption of ERP;

- A set of factors can lead to the success or failure of ERP implementation;

- A set of challenges can lead to ERP replacement in the post-implementation stage.

In terms of the benefits which drive the adoption of ERP, HEIs have mainly focused on the expected benefits, as addressed on many occasions across the previous sections. According to previous studies conducted by many authors, such as (Shang & Seddon, 2000); King, Kvavik & Voloudakis, 2002; Shang & Sedden, 2002; Xu & Quaddus, 2013; AlQashami & Heba, 2015), these benefits are seen to involve improved internal data workflow, such as student online registration procedures; and improved operations planning within institutions through the provision of relevant information required by different groups of people to enable the effective conduct of a new business process, such as e-government, e-procurement and e-commerce. This in turn is expected to enhance communication between different departments within the organisation to enable better possibilities of sharing information; to increase cooperation and speed up the business processes; to allow the creation of one transaction system to share data; to allow standardisation and integration of processes; to reduce information system maintenance costs and reduce duplication of data; and to increase competitiveness in an aggressive market environment. HEIs have come under increased pressure to maximise their resources as well as the values and benefits embedded in their existing technology infrastructure; therefore, many organisations tend to use ERP for this purpose, and the number of organisations using ERP is increasing (Waring & Skoumpopoulou, 2012).

In terms of the factors which can lead to success or failure in the ERP implementation stage, Esteves and Pastor (1999) identified 20 ERP successes, categorised into Organisational, Technological, Strategic, and Tactical types. This categorisation was later extended to include People and Vendors (Zhang et al., 2003; Zhang et al., 2005). Other researchers, such as (Haft & Umble, 2003) and Abugabah and Sanzogni (2010) have summarised the reasons for ERP implementation failure, which include technical difficulties, top management support, training and education obstacles, ERP selection, and poor project management. However, the use of ERP in HEI can generate different types of challenges, but as the implementation challenge is beyond the scope of this thesis, the author summarises the general challenges of ERP implementation in HEI in Table 2.4, in order to give a general understanding of the challenges that might have an influence in future ERP stages.

Table 2.5: Summary of ERP challenges in HEIs

Risks	Identified by
• Organisational fit; • Skills mix; • Management structure and strategy; • Software systems design; • User involvement and training; • Technology planning and integration.	Sumner (2000)
• Lack of support from senior management; • Lack of a clear strategic vision; • Lack of ability to meet business targets; • Breakdown in communication between users; • Lack of training provided; • Lack of support from users; • Legacy issues; • Lack of understanding of need to change management practices.	Huang et al. (2004)
• Forcing organisations to apply best practice without considering organisational structure.	Zornada & Velkavrh (2005)
• Human-related factors.	Helo et al. (2008)
• Delays in implementation and consequent overspending of allocated budget.	Ehie and Madsen (2005); Helo, Anussornnitisarn & Phusavat (2008, cited in Helo et al., 2013)
• Changes in ERP features and customisations applied by the organisations lead to failure.	Scott and Vessey (2000); Helo et al. (2008); Maditinos, Chatzoudes and Tsairidis (2012, cited in Seo, 2013)

Furthermore, as noted in the discussion of the literature reviewed, there are very few studies assessing or examining problems related to the impacts on the use, maintenance, review and enhancement of implemented ERP systems in HEIs, known as the post-implementation stage. Abugabah and Sanzogni (2010) stated that most of the literature which discusses issues related to failures of, and risks to, ERPs in Australia focus on the stage prior to implementation, not the post-implementation stage. Despite this, many HEIs upgrade or replace their system. The existing literature also reflects a corresponding shift in research into areas beyond ERP selection and implementation issues, often referred to in the literature as the second wave. However, the researcher only found three papers focusing on HEIs in the post-implementation stage, all of which reflected the organisational, departmental and individual factors that impact on ERP usage in Pakistan (Ahmer et al., 2016); success factors in the ERP post-implementation stage (Sullivan, 2009); and ERP stakeholder performance in the KSA (Althonyan, 2013). Thus, these papers looked at different organisational and technical factors but did not consider other external factors, such as cultural and governmental factors.

Consequently, due to the shortage of literature on the ERP post-implementation stage, the researcher conducted a further review of literature on this subject in other business contexts focusing on post-implementation problems and challenges that might impact on system continuation or its replacement. Peng and Nunes (2009) highlighted 40 ERP post-implementation risks related to diverse operational, analytical, technical and organisation-wide aspects. They critically and systematically reviewed the available literature on ERP post-implementation risks, and found that operational risks included issues such as staff reluctance to use ERP systems and incorrect inputting of data. They also found that ERP systems contained inaccurate or incomplete bills of material; inaccurate inventory records; and conflicts between accounting and non-accounting staff (Peng & Nunes, 2009). ERP post-implementation risk and failure factors in HEIs specifically include those relating to a lack of adequate staff training, as HEI staff feel either reluctant to use, or uncomfortable using, ERP systems, without previous specialist training. This may be a factor that HEIs overlook, owing to overall ERP implementation budgetary constraints. HEIs may perhaps wrongly assume that the high level of education or intellect of HEI staff will be sufficient to allow them to master ERP systems, when in fact this may not be the case. Technical risks found by Peng and Nunes (2009) included different ERP modules not being seamlessly integrated;

incompatibility with existing legacy systems; outdated and duplicated data not being properly managed; and systems not being modified to meet new business requirements.

It can be argued that, as applied to HEIs, these post-implementation risk and failure factors relate to the quality, experience and professionalism of the ERP provider and installer. In addition, these may also reflect the type of country in which the HEIs are located, as developing countries may find themselves with a lack of experienced ERP partners, compared to more developed countries. There is therefore a specific choice that must be made by HEIs, but this may be limited, depending on the expertise of available ERP partners. Analytical risks found by Peng and Nunes (2009) included frontline managers refusing to use the ERP system; managers being unable to retrieve relevant and needed information; and a failure to use the system to generate accurate sales forecasts. Further analytical risks include the ERP system failing to generate appropriate master production schedules and net requirement plans (Peng & Nunes, 2009). These analytical risks seem to be more relevant to businesses that produce goods, i.e. in terms of supply chain and sales forecasting failures. However, the refusal of frontline managers to use the ERP system also highlights the need to ensure cultural change, and that an ERP change management plan is put in place to aid HEI staff and students during the transition phase.

Finally, it was noted by Peng and Nunes (2009) that organisational-wide risks included top managers making important IT decisions without consulting IT experts, and the latter not providing sufficient support to ERP, post-implementation. As applied to HEIs, this may be the result of top management incorrectly, concluding that the ERP system has been successfully implemented and therefore 'moving on' to other educational priorities. This lack of support by top management may then result in a failure in the flow of funds and information, as well as conflicts and arguments in relation to ERP issues (Peng & Nunes, 2009). Other barriers or failure factors include ill-defined ERP post-implementation plans; insufficient post-implementation ERP funds; a loss of qualified IT/ERP experts; a loss of ERP-related knowhow and expertise; and problems with data access and unauthorised access to confidential data (Peng & Nunes, 2009, p. 933). It can be argued that the large number of ERP post-implementation risks and barriers means that the post-implementation stage is one of the most crucial aspects of the whole ERP lifecycle. For HEIs, this means that ERP partners must ensure that they clearly stress the importance of post-implementation phases to HEIs and to their top management.

This argument is supported by a case study research investigation undertaken by Pan et al. (2011) into the risks affecting ERP post-implementation in a large Chinese manufacturing group (the 'Shagang Group' or 'Sha Steel Group'). Pan et al. (2011) applied the comprehensive risk ontology of 40 ERP risk factors, designed by Peng & Nunes (2009), to this Chinese manufacturing group, in 80 questionnaire surveys sent out to its managers and IT users and experts. It was found that, instead of the expected technical risks, organisational and human-related risks formed the seven most crucial factors for potential ERP failure (Pan et al. 2011). These seven factors included operational staff being unwilling to use ERP systems; a lack of sufficient technical support from system vendors; and a loss of qualified in-house IT/ERP experts (Pan et al. 2011). Consequently, it can be argued that the most prominent ERP post-implementation risks and failure factors relate to human elements in the ERP lifecycle. This means that staff training, cultural change plans, high involvement of top management, and ERP project leaders or champions are crucial to successful ERP post-implementation, as they would seem to be the highest risk factors for HEIs, assuming that they are able to choose a skilled, professional and well-established ERP partner.

From another perspective, cost, technology, business and staff ability have been identified as four central concepts from an alternative viewpoint, that of the practitioner (Klee, 2009). In this instance, an overhaul of the lead system and implementation of a more modern ERP system seems the most sensible course, as the expense of running a more dated system increases as the introduction of innovative technologies continues and as alterations in business operations are made. Klee's perspective was also assessed and supported by Bento and Costa (2013). Esteves and Pastor (1999), Ahituv et al. (2002) and Bento and Costa (2013) all proposed that, regardless of the actual precision and soundness of an ERP system, if it is no longer sufficient for operational needs, and has not kept pace with a company's requirements and the tasks required of it, or if the company's capabilities have rapidly declined, it should be replaced. It is likely that the incremental introduction of an alternative would then be necessary, as operators' discontent starts to increase. Klee (2009) and Bento and Costa (2013) noted that the introduction of an original ERP system is no longer that much more expensive than upgrading a system. Although upgrading or introducing significant additional capability for an existing system are possibilities, if fiscal losses from an unsuccessful project are significant then introducing an alternative system should also not be ruled out (You et al., 2012).

Haddara and Elragal (2012) carried out a convenience case study of an SME to examine why and when organisations retire their ERP systems and found that the ERP system was replaced because of an unwise initial choice, or a lack of user involvement. The functionality of the system did not meet minimum business requirements. Other factors included the inability to augment all of the information of every business unit; complex reporting techniques; a lack of web-based interfaces; a lack of awareness regarding the main method of official implementation; the wrong choice; and no implementation contract. In the same paper, Haddara raised concerns about the lack of studies examining factors that lead to ERP replacement, which means that there is a considerable gap in the literature.

Throughout the critical analysis of the previous literature, the researcher was able to identify all issues that might impact on ERP perceptions. However, prior studies have explored and identified different problems and challenges, technical and non-technical, which have occurred in relation to ERP post-implementation activities. However, these studies simply link these ERP problems directly to ERP replacement or failure, and neglect the phenomenon of ERP obsolescence. In reality, these problems will firstly cause different types of obsolescence, which will then lead to ERP obsolescence and eventually to ERP replacement. Therefore, this study aims to fill this knowledge gap by adding an important layer of thinking about ERP obsolescence and exploring how the different organisational and socio-technical ERP problems can lead to ERP obsolescence in the post-implementation phase, thus filling the gap in the ERP lifecycle theory. Not only has a scarcity of empirical research been found to support this phenomenon but also the existence of this stage is not acknowledged by the majority of contributors in the field. The data collected in the current study clearly highlights this current deficiency in the literature to date. As IS researchers, it is necessary to take advantage of such circumstances in order to develop our knowledge in the field and thus to explore and investigate this important stage of the ERP lifecycle. This is one of the main motivations for selecting this issue as the focus of this research: it is essential to review literature about the definition of obsolescence and its causes identified by research studies conducted in the past. Reviewing these issues has allowed the researcher to acquire a relatively good understanding of the theory around obsolescence, establish the necessary background to the exploration and enhance the theoretical sensitivity with which these issues are discussed in the following section.

2.7 ERP obsolescence definitions, reasons and types

As mentioned in Chapter 1, it was difficult to identify the meanings and conceptions of obsolescence in the ERP literature. From the researcher's knowledge, no study has been conducted on this research area. Despite the literature of IS addressing a few issues which can be considered as examples of obsolescence, it has not yet been possible to clearly define the concept of obsolescence. Therefore, considering product obsolescence in manufacturing was necessary to enhance theoretical sensitivity.

According to Bartels et al. (2012), obsolescence refers to "*materials, parts, devices, software, services and processes that become non-procurable from their original manufacturer or supplier*" (p. 2). Cox and Blackstone (1998) defined obsolescence as "*the condition of being outdated*", as a result of the appearance of new product in the market that make the previous product no longer useful or desirable. Pijnenburg (2011) highlighted conditions of the obsolete states where the system no longer optimally performs its established function

Some causes of obsolesce have been identified previously, by various authors:

- The disappearance of original component manufacturers (OCM) or original equipment manufacturers (OEM) from the market for a variety of reasons (e.g. the OCM or OEM were not interested in continuing to produce the product for economic reasons), forcing organisations to replace or change the product or services (Cretenet, 2004; Atterbury, 2005; Aker Solutions, 2009).

- Feldmann and Sandborn (2007) saw that the fast development of technological tools made some products or services fall out of fashion, for various reasons (e.g. economical, legal or technical, etc.).

- Ageing, caused by chemical or physical interactions, negatively affects productivity and the functioning of products and services, putting them out of use, as stated by (Bartels et al., 2012; Cretenet, 2004; & Aker Solutions, 2009).

- Perry (1994) and Tomczykowski (2003) identified electronic parts obsolescence as a vital aspect of IS obsolescence. From this perspective, based on the fact that ERP is considered to be an information system, such electronic obsolescence could have an influence in the field under study, but previous studies have not yet addressed this influence.

- Sandborn (2007) stated that software could have its own obsolescent aspects, caused by Functional Obsolescence related to hardware requirements or other software changes to the system, making the functionality of the software obsolete; by Technological Obsolescence related to renewing, maintenance and termination, and the issue of the suppliers' continuing support for the system; by Logistical Obsolescence related to digital media obsolescence, formatting or degradation limits, or the termination of access to software.

- Pijnenburg (2011) identified further factors influencing obsolescence: Capacity (the system can no longer be extended to support further activities); Performance (where the response time is inadequate for the users' needs; Availability (where the part cannot be purchased); and Support (where both supply lines and knowledge required become scarce and very expensive to acquire).

Sandborn et al. (2012) added a new type of obsolescence related to skilled human resources, which are able to continually support the system: "*Human skills obsolescence is a growing problem for organizations, as they try to estimate and mitigate the effects of an ageing workforce with specialized (and possibly irreplaceable) skills sets*" (p. 1). This agrees with Trimmer et al. (1999), who argued that the development and maintenance of an IS depends on skilled professionals who are capable of directing and managing the system's operations and functions. They stated that "*it is becoming increasingly difficult for information technology professionals to maintain up-to-date professional competency*" (p. 1). This can be considered a major form of obsolescence, leading to the replacement of an information system.

In the IS literature, Rishipal (2013) argued that, due to frequent changes in the business environment, which suggest more advanced technological innovations, employee obsolescence has become a critical matter, adding that an employee becomes obsolete when he or she is unable to cope with the changes. Rishipal (2013) referred to Jones and Cooper (1980) and O'Reilly (1981), who identified obsolescence as the extent to which a manager's knowledge and skills have failed to keep pace with the current and likely future requirements of his/her job.

Accordingly, Rojo et al. (2010) studied the various factors which can cause a sustainment-dominated system to become obsolete, including the lifecycle of a system. These factors include the loss of original manufacturers of items or suppliers of items or raw materials, which thus comes under the condition of 'discontinuance', or the rapid development of technology making the system obsolete (unable to function). Pecht and Das (2000) argued that the life of system components can be shorter that the life of the system itself, which can be considered as obsolescence.

Knights and Murray (1994) stated that legacy systems in the organisation can be influenced by rapid changes in technologies as well as volatile market conditions, which may often cause failures in organisations because of obsolescence. Shad and Chen (2012) added that, in countries like Pakistan, poor technology infrastructure and the instability in markets and economic and political systems can be factors that make any IS, including ERP, obsolete. Kathy (2003) argued that the adoption of an IS in a business organisation requires change management, which in turn requires an understanding of the organisational culture and how to change it, so that the IS does not fail or need to be replaced.

Based on the above discussion, the current IS literature does not give a clear picture about this phenomenon, and thus could not be considered as providing a sufficient foundation to this research project. Moreover, the researcher found out that the previous literature is more abstract, providing a low level of understanding of product obsolescence without critically identifying the factors that contributed to such obsolescence. This resulted from using the same method of investigating obsolescence as that used in non-empirical studies. Furthermore, the categorisation of the obsolescence in the literature shows that most of the research on obsolescence has focused on the electronic components, whereas very few studies have considered the obsolescence in other aspects of the system such as software, hardware and human resources. It can also be appreciated from this categorisation that most of the literature has dealt with obsolescence at the component level and not at the organisational or system level. Consequently, this cannot be considered as a sufficiently robust framework to be adopted as an a priori framework to guide the data collection and analysis. Thus, theory development is more likely to emerge from and be grounded in data, partly because most of this literature is from a Western context, which is very different from the Saudi context, especially for public phenomena such as HEIs.

2.8 ERP in Saudi Arabia and in Saudi HEIs

It was argued in Section 2.6.2 that the interests of HEIs in using ERP were driven by the features as well as the benefits which HEIs were expecting to receive, and that some of the institutions replaced all management, financial and administration computer systems with ERP (Pollock & Conford, 2004). In the Saudi context, a study was carried out by Hussein (2014) to examine the ERP systems used in three different universities, namely King Abdul Aziz University (used ODES plus), King Saud University (used MADAR) and King Fahd University (used e-Moraslat). Hussein (2014) found that all three systems were used to serve administrative and academic sections in all of these universities, and their branches were the administrative section, covering human resources, financial management, procurement management, warehouse (store) management, student registration management and library services. Noaman and Ahmed (2015) examined the functionalities of ERP systems in Saudi Arabian HEIs, and concluded that the responsibility for establishing a specific ERP road map for higher education functionalities should rest with the Ministry of Higher Education, in order to control universities' operations and enhance the process of management. They added that the road map should be able to provide a new statement of requirements for ERP in HE to which the ERP vendors should respond with a new ERP, specifically addressing the real needs of higher education.

In an earlier study by Al-Turki et al. (2006), it was suggested that Saudi Arabia is in a transient phase regarding the implementation of ERP within organisations, with many organisations either having already implemented or were planning to implement it. Nevertheless, they also noted that, although Saudi organisations are not far behind their Western counterparts in terms of ERP implementation, the current trends are very rarely reported in the ERP literature (Al-Turki et al., 2006). Consequently, Al-Turki et al. (2006) undertook a questionnaire survey of 74 Saudi companies regarding their ERP practices, with the majority of businesses responding being in the oil, gas and petrochemicals sectors (although retail, information technology and banking sectors also participated). The results showed that SAP and Oracle were the clear leaders in the Saudi ERP market (with market shares of nearly 40% each), and furthermore that most of the organisations surveyed were SMEs with less than 5,000 employees (Al-Turki et al., 2006). What was also interesting was that the results showed a high concentration of implementation of 'core' ERP modules, including Finance, HR, S&D and Manufacturing modules (Al-Turki et al., 2006). The results suggest that implementing

business leadership-led ERP, rather than IT-led ERP, produces more successful ERP implementation, and that some larger organisations (e.g. Saudi Aramco and SABIC) still characterise their efforts as 100% successful, despite being over budget and over schedule (Al-Turki et al., 2006).

The implementation of ERP in Saudi Arabia is not limited to private companies and organisations, but has also been implemented in a number of public HEIs, such as King Abdul-Aziz University, Al Jouf University and Shaqra University. Nevertheless, the situation regarding ERP implementation for Saudi HEIs is quite different to that of British or Western HEIs because, for example, British HEIs are now largely privately funded organisations, which are increasingly competing on the newly established educational market. They follow in the footsteps of American HEIs, which have been privately funded organisations for longer. On the other hand, in Saudi Arabia, the Ministry of Education is responsible for the central funding of its 25 public universities located throughout the country. Other challenges in implementing ERP systems in the Arab education sector have been noted by Al Kilani et al. (2013) to include the following: whether the HEI is located in a developed or developing country; the existing IT infrastructure in the HEI; the IT maturity knowledge level of employees' IT skills; and the extreme costs of ERP systems (especially for smaller educational organisations). On the other hand, a case study of the implementation of ERP in King Saud University in Saudi Arabia highlighted the fact that the most important critical success factors (CSFs) were project management; ERP selection; stakeholder participation; business process re-engineering and customisation; and the commitment and support of top management (Aldayel et al., 2011).

In terms of studies which have been conducted to examine the performance evaluation of ERP in the post-implementation phase in Saudi universities, Imran (2013) demonstrated that there are ten critical success factors, which should be considered and analysed by academic institutions in order to achieve a successful performance evaluation of ERP, including top management support, project missions and strategies, project schedule and planning, appropriate operational technology, appropriate personnel, skills and expertise, a strong control system, monitoring and feedback, user acceptance, crisis management, strong project communication, user participation, change management, organizational fit and adaptability, human motivation, support and consideration, progressive corporate culture and work climate.

Another study by Al-thonayan (2013) examined the influences of ERP systems on Saudi academic institutions. The study was concerned with stakeholders' post-implementation performance. Al-thonayan (2013) examined three case studies, using mixed methods of interviews and questionnaires, collecting both quantitative and qualitative data. The findings suggest that, although each case had its own context, eight factors had an influence on stakeholders' post-implementation performance. Six of these factors are related to the system quality dimension, including timeliness, flexibility, ease of use, content, currency and authorisation. The remaining two are related to reliability and responsiveness in the service quality dimension. These results were consistent with those of the qualitative phase. Further factors, such as resistance to change, continuous training and education, appropriate systems customisation and top management, seem to have a noticeable impact on stakeholder performance. However, the findings of this study, similar to the results found in other Western contexts, are inevitably influenced by specific cultural factors, which consequently influence the system, as ERP/IS is not only a technical phenomenon but also involves social factors. This illustrates a knowledge gap in the previous ERP literature

2.9 Summary of reviewed literature and gaps in current literature

Through the literature review, the researcher was able to identify five research gaps, namely, a Contextual Gap, a Knowledge Gap, a Conceptual Gap, an Analytical Gap and a Methodological Gap, as seen in Figure 2.17.
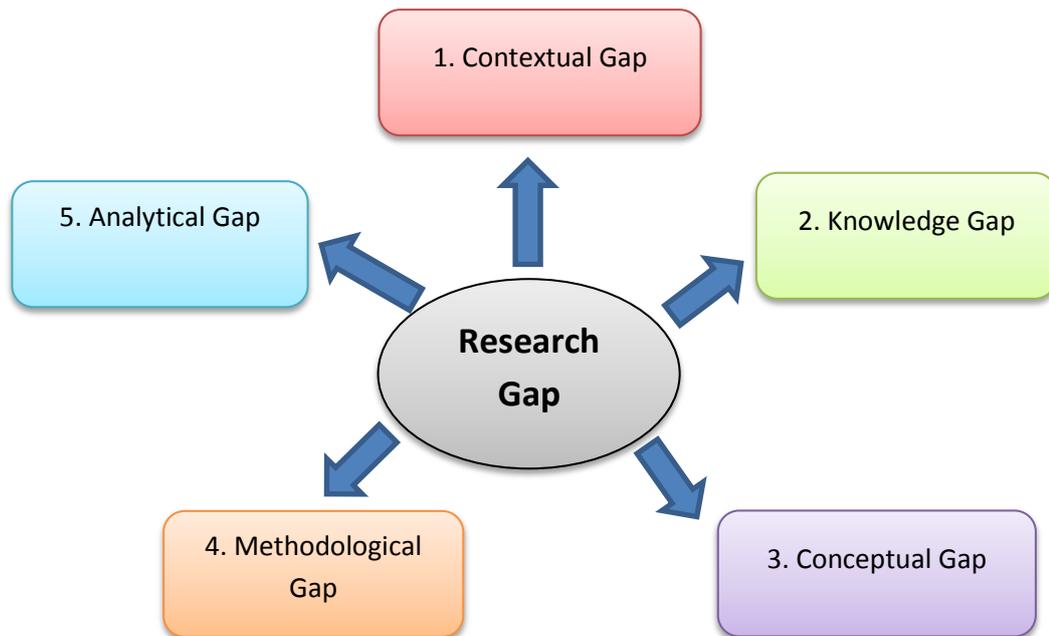
Figure 2.17: Research gaps

Contextual Gap

Despite the ERP system being widely implemented in the Saudi context, especially in HEIs, there is an obvious research gap in HEI research in terms of the post-implementation stage in particular. As the Saudi government are currently spending money on developing the education system and its services, it is beneficial to fill this research gap found in current studies in the Saudi context (Saudi Arabia Minister of Civil Service, 2013; Saudi Arabian Higher Education Board, 2013; Awad, 2014).

Knowledge Gap

In terms of the Knowledge Gap, in ERP post-implementation in HEIs, the researcher reviewed more than 162 studies on ERP from previous research conducted on ERP systems, looking at different stages of the system, including pre-implementation, implementation and post-implementation, in different contexts and countries. The literature review highlighted a lack of ERP studies in HEIs in general and on the post-implementation stage in particular. To the researcher's knowledge, there are only three studies about ERP in HEIs and these consider the challenges from technical perspectives rather than non-technical ones. Also, the current literature does not identify and investigate the relationships between factors, as explained in Section 2.6.

In addition, the current ERP literature indicates that the findings related to ERP problems in HEIs are similar to business organisation problems, which should not be the case, since there are significant cultural differences between these areas; this is thus considered to be another research gap.

Conceptual Gap

On the basis of an extensive search of the literature in both the English and Arabic languages, it was concluded that very few existing studies can provide insightful indications for this research project. The current literature relates ERP challenges and problems to the direct replacement of the system in the post-implementation stage. However, since ERP systems go through different stages in the lifecycle, including implementation and post-implementation, as mentioned in Section 2.5.2, each of these stages has different activities and challenges. The current ERP lifecycle indicates that these different activities face various problems, which will directly end in software replacement. In reality, these challenges will firstly cause different types of ERP obsolescence, which will then eventually lead to the replacement of the ERP system. Therefore, this is considered to be a conceptual research gap in the current research, so it is necessary to add a layer of thinking about ERP obsolescence and explore how the different organisational and socio-technical factors can lead to ERP obsolescence in the post-implementation phase. The data collected in the current research clearly highlights this gap through literature comparison. This will thus fill a gap in the ERP lifecycle theory which has existed for more than a decade, since the ERP/IS field has not yet defined this essential concept.

Methodological Gap

The current literature review also identified that most previous ERP studies took a quantitative approach rather than conducting qualitative research. This brings limitations in terms of defining the concept and factors in relation to ERP challenges, as quantitative research relies on numbers rather than people's perceptions and opinions. Therefore, the current research uses a qualitative research approach to uncover people's opinions about the specific phenomenon under investigation. Instead of deductively testing an existing theory in the research context (as there are no sufficient conceptual frameworks that could be introduced and evaluated to be accepted as the theoretical framework to guide the data collection and analysis stage), it was therefore more

appropriate to inductively develop a theory which is explainable and applicable to ERP obsolescence in Saudi HEIs.

Furthermore, as a consequence of existing empirical research and literature being seemingly absent, the subsequent phases of the study lack the production of theory and a formal theoretical approach, given that the provision of a detailed and established theoretical basis is lacking. Existing literature that is outside of the ERP research area typically forms the foundation for the majority of investigations into obsolescence. Resultantly, this research is more suited to a methodology that seeks to use primary data to let theory develop from it, thus a grounded theory method is appropriate. The following chapter investigates grounded theory methods in a more in-depth manner.

Analytical Gap

The existing ERP literature also shows that there is an analytical tools gap in ERP studies. Since most qualitative studies used Nvivo in their research without clearly showing or presenting other tools such as concept map and code definition list for the analysis process, this research aims to fill the gap not only from a methodological perspective but also in relation to the analytical perspective of qualitative research on ERP in Saudi Arabia, by using different tools to obtain more in-depth knowledge about the phenomenon. This will be explained further in the next chapter (see Section 3.6.3).

2.10 Conclusion

This chapter has provided a general overview of the theoretical background to ERP obsolescence in HEIs in Saudi Arabia for three purposes: to enhance contextual and theoretical sensitivity; to locate appropriate theoretical frameworks to guide the remaining research stages; and to draw out implications for the research methodology and design. This started by providing a review of the definitions and concepts of IS and all of the issues that influence its conception. In order to understand the specific phenomenon of ERP obsolescence, it is important to understand firstly more general aspects of IS. The chapter also has provided a definition of ERP and its lifecycle, and all issues related to ERP in HEIs have also been addressed, including obsolescence. Finally, the review undertaken in this chapter has identified different types of research gap found in the current literature.

Overall, this chapter has provided important indications and considerations for the selection of the research methodology and research design, which are discussed in the

Chapter 3. Specifically, the next chapter presents the research philosophy of this project. The explanations regarding the choice of an inductive research approach are provided. In addition, the choice of a combined case study and GT research approach are set out in detail, and the advantages of this type of approach are assessed and practical details relating to data collection methods are provided.

Chapter 3: Research Methodology

3.1 Introduction

The aim of this chapter is to present the research methodology identified as being suitable for answering this project's research questions and for meeting the identified research aim and objectives. Considering the fact that selecting an appropriate methodology is a critical task, because unsuccessful choices can lead to invalid outcomes, reviewing different possible approaches and methodologies is essential when making methodological choices. Therefore, the selection of a methodology requires reviewing an extensive range of research papers, theses and publications. According to Remenyi et al. (2003) and Collis and Hussey's (2009), research methodology can be defined as an "*overall approach to a problem which could be put into practice in a research process, from the theoretical underpinning and philosophical stand to the collection and analysis of data*" (p.22).. Therefore, this chapter is structured to represent the major steps which should be taken when conducting research, and consists of five main sections: research philosophy (3.2), research approach (3.3), research paradigms (3.4), research strategy (3.5), research design (3.6) research ethics and trustworthiness (3.7 and 3.8).

3.2 Research philosophy

Thinking carefully and critically about the nature of the research and the possible steps a researcher needs to respond to the research inquiry is the starting point of every researcher at the beginning of his or her research journey. Understanding the philosophical stances or assumptions of a study is a major requirement in terms of selecting a research strategy and research design so that a research project can be completed successfully. Collier (1994) noted that the alternative to philosophy is not no philosophy, but bad philosophy: "*The "unphilosophical" person has an unconscious philosophy, which they apply in their practice whether of science or politics or daily life*" (p.17).

In social science Bryman (2001) suggested two main philosophical assumptions: ontology and epistemology. According to Crotty (2003), ontology is "the study of being". It is concerned with "what kind of world we are investigating, with the nature of existence, with the structure of reality as such" (p.10). In this sense, ontology helps the researcher to ask the following questions: What is the nature of reality? What can be known?

Epistemology refers to the relationship between the researcher and reality (Carson et al., 2001). Byrman (2001) distinguished between two main ontological and epistemological assumptions in social science: positivism (or objectivism) and interpretivism or constructivism (also known as subjectivism). While positivism tends to involve examining a social phenomenon using natural science methods, interpretivism tends to involve exploring the phenomenon in terms of how it is understood by the audience who interact with it; the core of the approach is to examine the audience's opinions and perspectives about the phenomenon but not the phenomenon itself.

In addition, while the implication of positivism is a belief that the world is external and that only a single objective reality exists for any research phenomenon, this reality is considered as being beyond the researcher's perspective and human beliefs (Bryman, 2001). This means that positivist research remains emotionally neutral and separated from the participants of the research. In interpretivism the assumption is that there are multiple realities which are shaped by social and historical facts. Bryman (2008) added that, from the interpretivist perspective, there is no one truth, as the world builds up social foundations and meanings, with the interpretations of meanings being at the core of this perspective. In that sense, knowledge is socially constructed rather than objectively determined. According to Bryman (2001), in interpretivism the researcher remains open to new knowledge throughout the study and lets it develop with the help of informants.

This research leans more towards interpretivism. The investigation conducted in this research is based on a phenomenon rooted in live interactional experience. Therefore, the assumption is that knowledge is socially constructed through people's interpretations and so the research involves capturing participants' subjective insights into ERP. Thus, the interpretivist epistemological position is adopted to gain an in-depth understanding of social reality through the study of people's interpretations and attitudes. The research aims and objectives seek to obtain the participants' varying perceptions, opinions and meanings via human interaction. This suggests that the phenomenon under investigation is not considered as reflecting an independent and single reality; rather, knowledge is obtained through understanding the participants' interpretations of the reality. Accordingly, an interpretivist position is adopted in order to understand the social world as an outcome of the participants' interactions within a studied context.

3.3 Research approach

As mentioned in Section 3.2, this study is based on the interpretivist position in relation to its epistemological perspective; it is important to select a suitable research approach to accomplish the research aims and to answer the research questions. According to Bryman and Bell (2003), the core of identifying a research approach is to understand the type of interaction between the concerned social phenomenon and the related examined theory. In social science, Saunders et al. (2007) and Bryman (2001) identified two different approaches: deductive and inductive.

According to Bryman (2001), a deductive approach clarifies the relationship between theory and social studies. Gorman and Clayton (2005) considered Saunders et al.'s (2007) opinion, stressing that the deductive approach suggests starting with a theory (questions, hypothesis) and then moving onto the fieldwork. Theory or questions will become more predictive as the researcher starts collecting evidence. Therefore, researchers tend to rely on a deductive approach to identify the theory that is relevant to the research area and then articulate the theory in hypotheses, which means that themes and categories do not emerge from the data but from relevant literature or the researcher's own experience, and will then be examined through empirical fieldwork investigations. These steps allow the researcher to either confirm the original theory or to create a new theory. The deductive approach is also called the "top down" approach (Trochim, 2006) as shown in Figure 3.1 below:
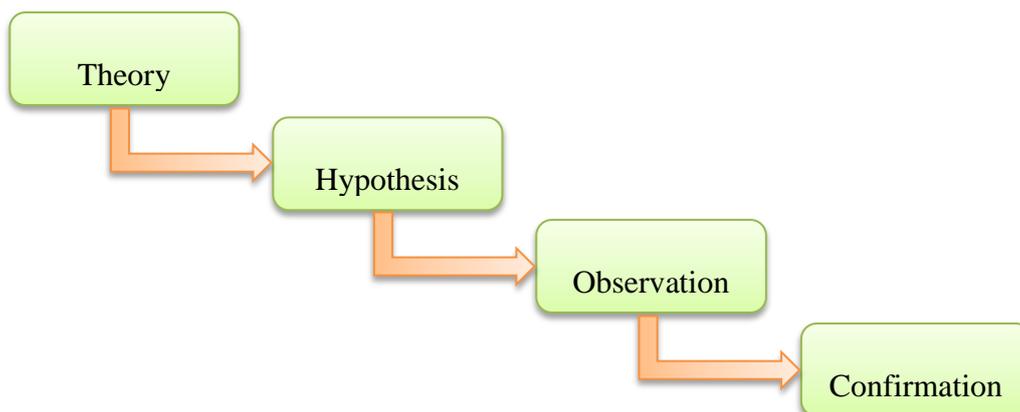
Figure 3.1: The process of the deductive approach, adopted from Trochim (2006)

As can be seen from Figure 3.1 the deductive approach begins with identifying a theory in relation to the research area. Hypotheses are then generated from the theory, and

these hypotheses are tested through empirical observation. Consequently, the original theory is confirmed or rejected (Bryman, 2001; Trochim, 2006). In addition, deductive research usually employs a positivist epistemological and ontological position (Bryman & Bell, 2003).

In contrast, an inductive approach is known as a "bottom-up" approach, as shown in Figure 3.2.
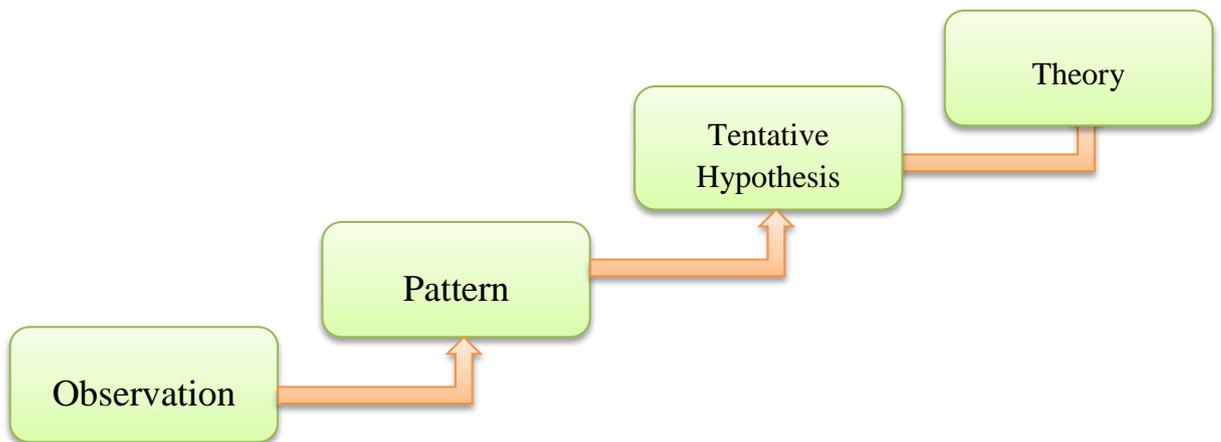
Figure 3.2: The process of the inductive approach, adopted from Trochim (2006)

As shown in Figure 3.2, the inductive approach starts with fieldwork observation, moving towards identifying patterns and consistencies which help in articulating the hypotheses, and the research conclusions develop theorisation (Trochim, 2006).

Moreover, Bryman (2001) pointed out that the inductive researcher needs to use his or her personal judgments and interpretations in order to evaluate the implications of the research findings and to build a theory. As a result, inductive research usually adopts an interpretivist approach (Gorman & Clayton, 2005).

Based on the above discussion, in the present study the implementation of the inductive approach is reflected in the use of semi-structured interviews to collect the relevant data, which enabled data to emerge, "not from the careful and exhaustive literature review of the traditional research design" (Charmaz, 1996, p.47). In addition, this research required an examination of the complex interactions between people (from different backgrounds) with different perspectives regarding the decision to replace ERP. Moreover, in order to obtain a fuller picture of the real situation and of how the phenomenon of replacing ERP is conceived and dealt with by people, an inductive

approach is utilized, in order to meet the aims and objectives of this study. As was also shown in the literature review chapter, there was no base theory to apply, meaning that the deductive approach was not applicable.

However, Strauss and Corbin (1998, p. 294) highlighted that the inductive approach is characterised by a number of disadvantages, one of the most notable being researcher bias. These scholars concur with Gray (2009, p. 15), who stated that, in the inductive approach, theoretical frameworks are entirely overlooked. Charmaz (2006) also reflected this idea when arguing that the individual conducting the research is invariably impacted in their investigations by preconceived notions, the area of specialism in which they work, and their cultural background. In view of this, the inductive processes included in the current research are carried out on the basis of not attempting to prove or discredit any particular theory.

3.4 Research paradigms

There is consensus in the scholarly literature that the two primary research paradigms: quantitative and qualitative (Saunders et al., 2007; Bryman, 2001; Veal, 2005). As mentioned in Section 3.2, the current study incorporates an interpretivism position and an inductive approach. Given this philosophically informed ground, one must determine which paradigm is the most appropriate.

As detailed by the aforementioned authors, the quantitative research paradigm is typified by a researcher gathering numeric data. To be specific, Veal (2005) noted that the quantitative paradigm depends on data of this kind for the purpose of evaluating theoretical concepts and formulating supportable findings. Therefore, the viability of findings can be increased by gathering data from a sample group of considerable size (Veal, 2005).

Bryman and Bell (2003) attached a series of philosophical processes to the quantitative paradigm, the first being that it is associated with deduction, and employed in order to evaluate theoretical concepts and hypotheses. Secondly, the quantitative paradigm employs an objectivist or positivist stance and, in line with this, considers social reality to be external. Finally, the scholars explain that the quantitative paradigm includes norms and models that are derived from the natural science disciplines.

Bryman (2001) noted that, contrastingly, the primary objective in qualitative research is to gather information that illuminates individuals' viewpoints and attitudes. In a detailed

explanation of the qualitative paradigm, Gorman and Clayton (2005, p. 3) first noted that it is an investigative process that gathers information from a particular situation wherein phenomena take place. The purpose of this process of information collection is so that one can utilise an inductive perspective in order to gain insight into that specific context, the attitudes of the individuals involved, and to explain the nature of these situations.

Veal (2005) argued that the sample size in qualitative projects is not normally extensive. As opposed to this, it is preferable in this process to acquire highly detailed data from a smaller sample group than one would in the case of a quantitative research study. Bryman and Bell (2003) again attached a series of philosophical processes to the qualitative paradigm, the first being that, in contrast to quantitative deduction, this paradigm emphasises induction and the development of theoretical concepts. Secondly, social reality is not regarded as external; instead, it is considered as being subject to continuous alteration by social entities, and it utilises a constructivist or interpretivist stance. Finally, it does not conform to the conventional activities that are engaged in when the natural science model is employed; in contrast, it is dependent on qualitative investigators extracting meaning from a social reality that is constituted of numerous entities.

Given the aim and research questions of the present study, it was determined that the qualitative research paradigm would be appropriate, firstly of all because the present study is founded on the interpretivist assumption. Secondly, the research objectives will be achieved by gathering information regarding the attitudes of the respondents. Therefore, interpretation of the attitudes and opinions will form the central strand of the inquiry, highlighting the greater suitability of the qualitative paradigm. Finally, given that this research can be categorised as inductive as opposed to deductive, the primary intention is to produce a theory as opposed to evaluate a theory.

3.5 Research strategy

Scholars such as Bryman (2008), Punch (2005) and Saunders et al. (2003) have viewed research strategy as the academic guidelines or plan adopted by a researcher in order to answer the research questions, including the identification of objectives and the specification of research sources in a social context.

In the context of qualitative research, Denscombe (2010) identified five different strategies that can be used answer qualitative inquiries: action research, ethnography,

phenomenology, grounded theory and case study, considering each approach as having its own protocol and its own purpose. In the following sub-sections, more information about each approach is provided, paying more attention to the case study and grounded theory strategies, which are the main strategies used to answer the research questions.

3.5.1 Action research

Reason and Bradbury (2001) viewed action research as helping researchers to combine action with reflection, theory and practice. It is a "democratic process concerned with developing practical knowing in the pursuit of worthwhile human purposes, grounded in a participatory worldview which we believe is emerging at this historical moment" (p.1). Brydon-Miller et al. (2003) viewed action research as having emerged from a broad range of fields, while Carr (2006), Kemmis (2006) and Day et al. (2006) referred to its emergence in support of educational processes in order to improve practices by requiring the people involved in a particular context to recognize the practical limitations of their applications. Their understanding supports Day et al.'s (2006) definition of action research, as the "*'Study of a social situation carried out by those involved in that situation in order to improve both their practice and the quality of their understanding'; this captures the essence of the philosophy underlying the action research approach*" (p.8). Accordingly, Hopkins (1993) recommended a specific framework of action research, which is useful to researchers who intend to understand the limitations of their educational activities and who aim to adopt an initial stance to highlight the problem, formulate a plan, apply a specific development, assess the outcomes and develop further strategies in an iterative fashion. Checkland and Holwell (1998) stated that, although there is no doubt that action research is able to empower the participation of the participants, the responsibility for monitoring and evaluation should not go beyond the researcher. In this study, the main aim is to understand the factors that lead to the obsolescence of ERP in the studied context, without providing any educational element or recommendations to improve any current process; therefore, action research would not be a suitable approach for this study.

3.5.2 Ethnography

Ethnography as a qualitative research approach is categorized as a social science approach (Fetterman, 1998), but having reviewed the research literature, it seems that ethnography is a term used in a wide range of disciplines and research topics. For example, Baszanger and Dodier (1997) commented that ethnography allows a

researcher to conduct an empirical investigation, namely observation, in order to examine people's lifestyles and everyday human activities. Furthermore, Denzin (1997) linked ethnography to reflections on human experience and interactions with the world around them from the point of view of their culture.

Harris and Johnson (2006) defined ethnography as "a written description of a particular culture the customs, beliefs, and behaviour based on information collected through fieldwork" (p.13). In this study, ethnography has not been selected as the main research approach, due to the fact that understanding people's perspectives on the obsolescence of ERP in the studied context is not intended as an analysis of personal cultural values, although such notions can appear as factors that lead to replacement. Therefore, the focus is not on a single, personal perspective, culture or life experience but rather on general factors that lead to ERP obsolescence.

3.5.3 Phenomenology

Although Husserl (1970) is considered to be the founding father of phenomenology, he was not the first to use the term. Nevertheless, he contributed positively to the development of the term as an improvement to the notion of phenomenology, based on his assumption that the study of consciousness is likely to be very different from the study of nature. Husserl (1970) insisted that knowledge of specific perspectives would not come from large-scale data but from a powerful study of experiences, performed through the phenomenological method. Phenomenology as a research approach is defined differently by different scholars. Pure phenomenological research seeks essentially to describe rather than explain, and to start from a perspective free from hypotheses or preconceptions (Husserl, 1970). Giorgi and Giorgi (2003) viewed phenomenology as "*A scientific method which is descriptive because its point of departure consists of concrete descriptions of experienced events from the perspective of everyday life by participants, and then the result is a second-order description of the psychological essence or structure of the phenomenon by the scientific researcher*" (p.251). Thus, phenomenology is an inductive research approach that focuses on collecting people's perspectives and descriptions of specific phenomena without needing prior controlled assumptions. In addition, the analytical process explains how interpretations and meanings have been assigned to findings, as well as making the researcher visible in the "frame" of the research as an interested and subjective actor rather than a detached and impartial observer. Plummer (1983) and Stanley and Wise (1993) stressed that the core purpose for using phenomenology is to make sense of

specific thoughts about specific phenomena and how they are perceived by the actors in a situation. Hence, using the phenomenological approach should be encouraged when a researcher aims to investigate specific phenomena in different contexts, in contrast to the case study approach, which allows a researcher to examine a phenomenon in one or in multiple related cases. As a result, phenomenology was excluded from the researcher's selection list.

3.5.4 Case study

According to Myers (1997), the case study as a qualitative approach is one of the most common research approaches used in the social sciences, which offers many advantages to a research study, and allows in-depth investigation of the issues at hand, though it is not without criticism. Myers (1997) identified the power of the case study to lie in its flexibility, in terms of the data collection and data analysis processes that it allows. At the same time, the case study approach can be combined and integrated with another research approach, such as Grounded Theory (Pickard, 2007). Yin (2003) defined the case study as an "*empirical inquiry that investigates a contemporary phenomenon within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident*" (2003, p.13). Eisenhardt and Graebner (2007) noted that case studies can be historical, while Dul and Hak (2008) argued that a case study approach is used when "one case (single case study) or a small number of cases (comparative case study) in their real-life context are selected and scores obtained from these cases are analysed in a qualitative manner" (2008, p.4).

From Denscombe's (2014) perspective, a case study is a suitable research approach when a researcher is willing to examine the studied phenomena or real-life situations, as it allows one to gain an in-depth and wide view of the relationships and processes within the phenomena. Although case studies are very common in qualitative research, Yin (2003) and Gerring (2007) argued that they can accommodate both qualitative and quantitative data. Yin (2003, 2009) maintained that a case study has two main characteristics: it examines current phenomena; and it considers the contextual conditions and links both of these to the phenomena and the social context. According to Yin (2009), a case study approach is expected to be used when questions such as "how" and "why" are being asked, and it is preferable to use this approach to answer questions about a contemporary set of events over which the researcher has no control.

Yin (2009) named three different types of case study: the exploratory traditional form, the descriptive form, and the explanatory form. According to Schell (1992), case study designs and applications can have different exploratory, descriptive or explanatory purposes, and may take typical, critical or deviant approaches. In addition, and in order to investigate more complex contexts, different approaches may be adopted that include a variety of processes. Schell (1992) added that descriptive case studies may be exploratory when little research has previously been carried out in the studied area, "*Or they may be illustrative of aspects thought to be representative or typical: Both exploratory and illustrative aspects may be included in a single case study, with accent being on the typical*" (p.6).

In terms of case study design, Yin (2009) argued that it is important for a researcher to identify which design to follow before starting the research, in light of the research aim and questions. Yin (2009) added that the benefit of selecting the case study approach is that the researcher will be able to collect more accurate data, which will help in making sense of and identifying links between different categories extracted from the research. In the same vein, Yin (2009) named four different case study designs: single-case (holistic) design, single-case (embedded) design, multiple-case (holistic) design, and multiple-case (embedded) design.

Yin (2009) stated that a single-case design is used when a researcher has a specific focus on one case and he or she intends to confirm critical issues in order to improve contributions to the theory or to examine a new and unique case. Yin argued that choosing a single case study design helps a researcher investigate a context which has not been examined previously. This design can be either holistic or embedded. With the holistic type, the unit of analysis is single. Such a design can be very important because of the possible threat of blocked access or because of a lack of data to generate valid results. In embedded design, on the other hand, the units of analysis can be multiple and they can consist of one unit and a few other sub-units. Adopting such a design allows a researcher to examine the studied phenomenon at different levels and to search for evidence through different units of analysis, but the case study should be large enough to accept such a design.

On the other hand, a multiple-case design allows a researcher to examine the phenomenon in more than one case, and the possibility of comparing between the case study findings is greater than what a researcher could achieve in a one-case design. Yin (2009) claimed that the strength of such a design is that it allows a researcher to

investigate wide contexts with the ability to use different data collection methods, including both quantitative and qualitative methods. In such a study, the validity of the data will be stronger, and again both holistic and embedded designs can be selected.

Yin (2003) admitted that the case study approach can be limited in terms of rigour, and it can be biased, in addition to the difficulty of generalising the findings, taking too long to complete and producing hefty documents; these are some of the common criticisms of case study research. In response, it was noted that the quality of a case study can be enhanced by either following Yin (2003) or Fellows and Liu (2008), whose four tests are common to empirical research, comprising construct validity, internal validity, external validity and reliability; or by combining the case study approach with another approach that allows an in-depth investigation, such as Grounded Theory. Moreover, with respect to Fernandez's (2004) opinion, when a case study is combined with Grounded Theory, the research study should be clear about which methodology will be the main approach.

In the present study, a case study was used to examine the factors that led to ERP obsolescence at Red Sea University because the single case study as an approach allows an in-depth examination of problematic contexts and phenomena. In addition, as the major concern of this study is to answer "what" questions, the case study is the most suitable approach to address such concerns. The possible problematic aspects of using a case study in combination with Grounded Theory (GT) can be related to the data collection techniques. Therefore, the selected techniques must be carefully applied to avoid any distortion of the natural emergence of theory grounded in data (Fernandez, 2004). This will be further explained in section 3.5.5.

3.5.4.1 Case study: Background

The Red Sea University (RSU) is a higher education institution involved in the provision of educational programmes for a broad array of Saudi and non-Saudi learners. RSU provides various undergraduate and postgraduate programmes, and the institutional aspirations are primarily linked to rising to the status of a world-class university with regard to pedagogical and technological innovation. Qualitative and quantitative enhancements have taken place at RSU since its founding, and it has gradually emerged as a prestigious institution with regard to the size of its student population, the standard of its courses, and the broad range of areas of study that can be focused on. One of the defining features of RSU is that it is the sole Saudi Arabian

higher education institution to provide specialist training in Geology, Medical Engineering, Meteorology, Aviation, Mineralogy, Sea Sciences, and Nuclear Engineering.

Soon after its establishment, the university employed and furthered several information systems formulated by resident and external specialists. In the 2005-6 periods, RSU developed an ERP system for the purpose of administrative automation, thereby enabling various departments to facilitate the internal execution of their transactions using the framework. The departments involved range from Human Resources, Accounting and Contracts, to Finance, Warehousing, and Projects. One of the key achievements over this period was the successful employment of the system, and each of the various modules was built on independently for a series of years. RSU introduced an additional ERP banner system in 2007, the purpose of which was to handle academic administrative functions. This currently includes student registration management and archive management. It is also worth highlighting that each ERP system is led by a distinct project manager and relates to numerous stakeholders.

As a consequence of RSU's consistent expansion over a period of years, the size of the student body along with the scale of the staff and departments increased. Naturally, the quantity of data and information being processed increased concurrently, and each of these processes necessitated alterations for the existing ERP system. Therefore, the information systems expanded considerably in order to incorporate a range of services for internal/external domain services.

Additionally, alongside the progression of an e-government scheme in the Kingdom of Saudi Arabia, RSU has worked towards the ideal of a *paperless university* and, moreover, was one of the initial public sector organisations in the country to input an ERP system that would facilitate holistic automation internally; this was achieved by enabling the integration of every department into a unified framework. The ERP system also facilitated the automation of all functions and services externally, and this was achieved through the adoption of abilities that guarantee integration with different public sectors. For the purpose of satisfying the emerging needs, RSU chose to replace the previous ERP system for another one, and this decision was made with the recognition that the previous system would require comprehensive transformation that could not be achieved with the levels of available IT staff.

In 2009, the university employed a new manager. The manager of the university thought that it would be better to integrate the processes, individuals and technology to achieve university goals and to increase its competitive ability locally and internationally. Therefore, the university established a deal with Java and IBM to install SAP ERP to serve the university campus. The main aim of this strategy, as claimed by the decision makers, was to help achieve *"transparency, streamline operations, maintain operational excellence and provide best-in-class facilities for its 140,000 students, according to SAP"* (Enzer, 2011, p.1). The decision to select this university for the case study was made based on the following justifications:

1. Red Sea University is a leading university in the Arab world; hence, the result of examining the phenomenon of ERP obsolescence in such a context would benefit more universities which have adopted ERP but have not yet installed its replacement.

2. The studied university is the largest public university in the Kingdom; the staff who worked in the IT department were from different nations and nationalities, which allowed more variety in terms of their conceptions and approaches, making the generation of a robust theory more likely.

3. It is a public university that had used different ERP systems for more than 8 years. It also has strong governmental support in terms of high budget availability compared to other universities.

   The aim of the research is to investigate the context in order to generate a theory based on the research results. Hence, with the recommendation of Yin (2003), the use of a single case study design was the best option. Furthermore, the phenomenon of ERP obsolescence appeared in this case study. As a researcher from an Information Systems (IS) background, this is an important and critical issue in IS that needs a deep understanding and a detailed exploration of the activities and factors related to this particular phenomenon. It was also suitable due to time and resource restrictions. According to Ragin (1992), generalisation from a specific case is possible, provided that the case advances comprehension of key aspects or extends thorough clarifications. Furthermore, a case study will be advocated by most academic researchers if the intention to generalise is clearly stated (Denzin and Lincoln, 2000). As regards the current research, the chosen case is believed to help to better understand the research aims, given its features and setting.

3.5.5 Grounded Theory (GT)

When a literature search was carried out on GT, it was found that, in the area of GT an extensive and rich literature exists discussing the process and stages of this approach (Glaser & Straus, 1967; Bryman, 2008; Skyrius & Bujauskas, 2010; Geri & Geri, 2011). In addition, Charmaz (2003) argued that the benefits offered by GT for IS research include the capacity to interpret complex phenomena. Fernández and Lehmann (2005) added that a researcher in a complex context such as an IS environment needs to use a research approach that allows him or her gain and create a complete conceptual understanding of the studied phenomena, which requires them to grapple with many interwoven and overlapping issues and themes. Hence, GT is an interpretive research approach that supplies research with rich data to create thick descriptions, which helps to disentangle conceptual relevance. Birks and Mills (2011) provided an interesting chronological development of GT, shown in Figure 3.3.

1967	The development of the theory by Glaser and Strauss
1978	Glaser theoretical sensitivity
1988	Strauss: Understanding of qualitative analysis for social
1990	Strauss and Corbin: GT procedure and technique
1992	Glaser: The principle of GT analysis
1994	Strauss and Corbin: Grounded theory methodology
1995	Charmaz: GT in rethinking methods in psychology
1998	Strauss and Corbin: Basics of qualitative research
2000	Charmaz: GT objectives and constructivist methods in handbook of qualitative research
2005	Clarke: Situational analysis
2006	Charmaz: Constructing GT
2011	Grounded Theory: A practical guide Melanie Birks and Jane Mills
2014	Strauss and Corbin: basics of qualitative research

Figure 3.3: Historical development of GT

Further to the argument provided by Glaser and Strauss (1967) that GT is able to accommodate social concerns, Charmaz (2003) and Goulding (1998) stated that GT is suitable for examining socially constructed experiences as it is free from the constraints of a priori knowledge that a researcher usually requires prior to carrying out research (Glaser & Strauss, 1967; Glaser, 1978), along with the method's ability to fit in with different types of research (Martin & Turner, 1986) and to be combined with other approaches (Pickard, 2007).

The development of the approach rather than its creation is the hottest area of debate in the literature. It has been stated by Glaser and Strauss (1967) that GT resulted from the collaborative effort of both Glaser and Straus, being introduced for the first time in 1967. The approach is built upon the philosophy that theory can be generated from the ground up, based on three major principles: constant comparative analysis, theoretical sampling and theoretical saturation. This indicates that the approach intends to help a researcher establish an inductive theory. As the GT theory was developed by Straus, who was able to make the theory more meticulous in the 1990s, it was put forward as a holistic qualitative methodology or as an approach to collecting or analysing qualitative data (Bryman, 2008). From Glaser's perspective, the strength of the approach was in the flexibility the analysis process provided (Douglas, 2003). According to Onions (2006), Strauss and Corbin's book, *Basics of Qualitative Research*, published in 1990, and Glaser's book, *Basics of Grounded Theory Analysis*, published in 1990, were able to indicate the conflict between both authors' perspectives towards the development of GT. One of the approaches is called the Straussian approach and the other the Glaserian approach. The differences between both approaches are evident in the paradigmatic dimensions, the formulation of research questions, the analysis procedures used, the use of literature, sampling procedures, and the procedures for validating the resultant theory.

Subsequently, Luckerhoff and Guillemette (2011) mentioned that, regardless of its occurrence, there is still some confusion about what constitutes grounded theory research, due to varying approaches and a lack of consensus on its use. According to Willig (2008), this appears as part of the chronological development of the theory. Barney Glaser and Anslem Strauss originated the theory and over the years several versions of the theory have been established, leading to disagreements and ambiguities about the nature of grounded theory methodology. The following section explains the

differences between Glaser's and Strauss's perspectives in order to provide an in-depth understanding of the differences between the perspectives and the issues raised between them.

3.5.5.1 Differences between Glaserian and Straussian perspectives

According to Annells (1996), the Glaserian perspective in GT leans towards post-positivism. The perspective relates ontologically to critical realism, a modified objectivist epistemology, and methodologically discovers theory through verifying it, using chronological studies. However, this perspective was rejected by Corbin and Strauss (2008), who tend to be more constructivist. Glaser (2002) orients towards uncovering a "true reality" while Strauss orients towards "constructive reality" (Corbin & Strauss, 2008). The challenge in the Straussian perspective is that there is no one true reality, as this relates to people's interactions with the phenomena in their context (Corbin & Strauss, 1990, 2008) and the question "how is the reality constructed in relation to people, time and place and their interactions?" is the most critical question to be answered. The Straussian perspective offers the researcher the ability to interactively construct reality with people, but such a view is strictly prohibited in the Glasarian perspective.

In terms of formulating research questions, the Glaserian perspective rejects formulating these prior to considering the research problem as part of the research process. However, from the Straussian perspective, the researcher needs to have a few research questions before accessing the research field. The researcher's experience, knowledge and time spent studying the literature can help in formulating the research questions. Interestingly, in both Strauss and Glaser's perspectives, there are no differences in terms of the role of the literature in developing the theory, but there are differences in terms of how the literature should be used. From Glaser's perspective, the use of the literature at the beginning will make the researcher subject to "forcing the data, suggesting that data should be compared to the literature once it is collected". On the other hand, Strauss suggests that it is necessary to use literature at all stages of research (Corbin & Strauss, 2008). Glaser (1978, 1992, 2001) suggested that an inductive approach is a major element of GT. This makes GT much more suitable in terms of evaluating complex social processes, and it helps researchers to generate a substantive theory from the data.

In terms of sampling procedures, there is agreement on the use of theoretical sampling and procedures of sampling, but Glaser made some criticisms of the Straussian procedures, called "model sampling", which "forces the data rather than letting them emerge" (Glaser, 1992).

In terms of analytical procedures, it is agreed that coding and making constant comparisons are the main approaches of GT, controlled by theoretical sampling. It is important also to mention that both perspectives agree that coding in GT encompasses open coding, axial coding and selective coding. Nevertheless, the idea of "force to data" is an important point; moreover, Glaser added that selective coding can only be started once the core category is created. A Straussian perspective, however, suggests that selective coding should take place at the beginning in order to generate the core categories themselves (Corbin & Strauss, 1990).

In terms of the procedures for validating the resulting theory, Glaser stressed four criteria: "fitness", "relevance", "workability", and "modifiability". However, Corbin and Strauss (1990) employed a variety of methods, including validity, reliability, credibility, plausibility and the value of the theory, the adequacy of the research process, and the empirical grounding of the research process as validators.

Regardless of the differences between both perspectives, both stand on the perspective of GT, or involve data to be grounded (Van Niekerk & Roode, 2009). In addition, making the best of the application of the Glaserian and Straussian GT perspectives can guide a researcher in how to combine the advantages and disadvantages of both perspectives, as well as involving the arguments and counter-arguments of a particular methodology in one's research. Researchers should make decisions by taking important issues into consideration, such as validity, or the value of the collected data to that corresponding to the methodological canons. The other indication concerns the number of units of analysis needed. Innovation in the research process will be greatly facilitated by having some guidance in applying the right procedures at the right time.

In this study, the researcher followed the Straussian perspective of GT because this research is concerned with the researcher's prior knowledge and experience in the area of ERP, the replacement of ERP and at the same time the factors that led to the replacement decision. Goulding (1998) stated that it is preferable for the researcher to

have previous knowledge, as this helps in building up the literature review, as well as in collecting data and in the processes of analysis. A Straussian perspective is flexible in terms of the research process and provides the researcher with wider analytical techniques to accomplish the research aims and objectives.

3.5.5.2 Main elements of GT

Strauss and Corbin (1990) identified three major elements of GT: concepts, categories and propositions. According to Corbin and Strauss (1990), concepts are drawn from the textual data collected from those participating in the phenomenon. The concepts are considered as the basic unit of analysis for developing the theory. They added that "*Categories are higher in level and more abstract than the concepts they represent. They are generated through the same analytic process of making comparisons to highlight similarities and differences that are used to produce lower level concepts*" (p.7). Hence, categories can be seen as the keystones for developing theory because they are more likely to include the means by which the theory can be integrated. Although Glaser and Strauss (1967) introduced propositions as the third element of GT, the term was further explained by Whetten (1989), who stated that proposition "*involve conceptual relationships, whereas hypotheses require measured relationships. Since the grounded approach produces conceptual and not measured relationships, the former term is preferred*" (p. 492).

To sum up, the three main elements of GT are mainly generated from comparative analysis, which suggests that firstly conceptual categories and their properties are identified and secondly hypotheses or generalized relations among the categories and their properties are formed. Hence, it is more logical to let the categories emerge than to come into the study with pre-set categories based on existing theories. The use of these elements will be explained later in the coding process section (3.6.3).

3.5.5.3 Benefits of using GT in this study

According to Hase (2008), GT has been extensively used in social science studies because it provides researchers with a systemic technique for finalizing the practical framework of the empirical work and the data collection processes. Goulding (1999) regarded the benefits of GT as being not only the space it gives to researchers to access and process a rich variety of data, but also as a result of its spiral process. At the same time, GT allows researchers to track the saturation level of the data so as to draw conclusions. Onions (1967) highlighted the fact that GT allows the researcher access to

the sources of data using either one or multiple methods, which promotes the extraction of different and rich perspectives. In addition, Martin and Turner (1986) stated that GT is suitable for examining phenomena in complex situations, where it can help in generating a comprehensive organizational account. Locke (2001) viewed GT as providing explanations of the complexity of the managerial process, which adds to the value of this study.

Lehmann (2001b) stated that the value of using grounded theory to complete research in the area of IS has now been acknowledged due to the value such research brings to the development of an understanding of people's interactions in relation to IS. In addition, it has been argued by different scholars such as Bryant (2002) and Glaser (1978, 1992, 1998, 2001) that GT provides a detailed, rigorous and systematic method of analysis. In GT, a researcher has greater freedom to explore the research topic and allow issues to emerge. From this perspective, GT can be powerful in terms of enabling rigorous insight into areas that are relatively unknown to the researcher. Also, taking in consideration Ellis and Levy's (2009) perspective that GT can provide additional value when the literature fails to support the theoretical evolution of phenomena, it is vital that a researcher is willing to select GT as a research approach. It is important to recognize the fact that GT is a method that allows a researcher to obtain an in-depth understanding of an area, which requires no preformed concepts of knowledge or reality.

Furthermore, as mentioned earlier in this chapter (Sections 3.2.1 and 3.2.2), the ontological and epistemological assumptions of this research support the notion that knowledge is not intangible and static but rather is emerging and transforming, and is interpreted as being so by both researcher and participants. The meaning of the phenomena is constructed through conversations, interactions and actions which embed understandings, experience, perspectives and emotions. Only through interaction and discourse can meaning be unlocked and expressed, and conveyed to the researcher. From this perspective, GT could be seen as a method which enables a researcher to arrive at true meaning and understanding of a phenomenon. In addition, for a researcher to be able to come up with a theory, he or she is required to become more aware of the studied problem through the views expressed by participants practising and engaging with the context. In this sense, the results of GT are more contextual explanations rather than descriptions, which help to form a "theoretical lens" for researchers and practitioners to communicate the research outcomes in practice. According to Pettigrew

(2000), GT can be used as either an approach for collecting and analysing data, or qualitative data collection methods can be combined with the original understanding of traditional GT. Hence, combining GT with other methods can be a suitable solution, as suggested by many researchers (Pettigrew, 2002; Easterby et al., 2006; Fernández, 2008). In terms of the data analysis process and with reference to Denscombe (2003), GT allows the researcher to use software such as Nvivo, Atlas and other programs for the purposes of qualitative data management and analysis.

3.5.5.4 GT and case study combined

There is no doubt that GT in itself is a strong qualitative and flexible approach which has been rapidly employed in research studies in the Information School at the University of Sheffield, and has contributed positively to the area of Information Management. Pickard (2007) identified some weaknesses with this approach, stating that the issue is not about the whole research design, rather it is about how the data will be collected and analysed, recommending GT be integrated with other research approaches such as a case study or action research.

According to Fernández (2008) and with reference to Glaser (1998), integrating GT with a case study can be a very effective decision, but a researcher should pay specific attention to the process of integration, so "that the canons of case study research do not distort the true emergence for theory generation" (Glaser, 1998, pp. 40–2). For example, with respect to Yin's (1994) statement that "Theory development prior to the collection of any case study data is an essential step in doing case studies" (p.28), the researcher needs to be aware of which GT perspective he or she should adopt to preserve the values of the philosophical stance. In other words, "The researcher must clearly specify which methodology is driving the investigation" (Fernández 2008, p.47). According to Rothwell (1980), a case study as a method allows a researcher to develop the theory and create a storyline because it has a constant comparative method. On the other hand, Easterby et al. (2006) suggested that GT helps in discovery and creation rather than in establishing accuracy and confirmation in the process of qualitative data analysis.

For the purpose of this study, the main Straussian methodology, Corbin GT and a case study, were employed in the design of the research. According to Yin (2003), the case study method allows the use of either one case study to achieve its exploratory purpose, which initiates the theory, or a multiple-case design, and is useful when the main purpose is to collect more descriptive information which will be cross-examined and

results generated. A single case study design was found to be the most suitable approach to meet the aim and objectives of this research. Hence, the decision to combine a case study with GT was made in order to strengthen the design of this study. In the following section, the researcher will provide more details about the use of the case study as a research design strategy.

3.6 Research design and stages

Vogt (1993, cited in Collis and Hussey, 2003, p. 113) described research design as relating to the specific ways in which research can be planned and carried out in order to generate outcomes that are characterised by the greatest possible validity. In light of this definition, it is clear that an effective research design is critical; in essence, it facilitates the provision of an action plan that can offer direction for the key processes of data collection and analysis. Therefore, the research design for this project is discussed in this section, followed by the research stages, which consist of four sections: a literature review phase; a data collection phase; a data analysis phase; and a comparative literature phase. Figure 3.4 below illustrates the activities belonging to each stage.

Step One
- **Literature review phase**
- Step1:Review the literature
- Step2: selecting the case study

Step Two
- **Data collection phase**
- Step4: sampling technique
- Step5interview process and tools

Step Three
- **Data analysis phase**
- Step 6: Coding process
- Step7:Therotical sampling
- Step8:Constant comparative analysis
- Step9: Theoretical saturation
- Step 10: Supporting tools
- Step 11: Theory development and writing story line

Step Four
- **literature comparison phase**
- step12 : Compare emergent theory with existing literature

Figure 3.4: Research stages

3.6.1 Step One: Literature review phase

3.6.1.1 Use of the literature review

In order to achieve the first proposed objectives of this research, the researcher conducted a review of literature in this area and found out that there are few studies about ERP in Saudi Arabia, more specifically in the HE sector and in the post-implementation stage. Since most of the universities were in the implementation stage at that time and more and more continue to implement ERP, they will be confronted with a wide range of challenges when actually using and enhancing the installed ERP system. ERP users, however, may often not fully understand and recognize the existence and impacts of these challenges, due to the present scarcity of research studies and guidance on these issues. One of the challenges found in the context of the present study is related to the obsolescence of the ERP system. Therefore, the focus of this study is on factors leading to ERP obsolescence. Then, it became essential to do more systematic literature review to gain a general understanding of ERP system obsolescence. In this way, too, the researcher became attuned to the dynamic and changeable nature of IS/IT environments in HEIs, and their wider social, political and economic contexts in general.

Strauss and Corbin (1998) suggested that reviewing the literature extensively prior to the fieldwork research may "constrain", "stifle" or even "paralyze" the researcher's analytical sense, which would lead to serious problems in the emerging theory, but at the same time it will improve the researcher's theoretical sensitivity, bearing in mind that theoretical sensitivity reflects the personal quality of the researcher and indicates an awareness of the weaknesses of the use of data. The sources of theoretical sensitivity are varied, such as the literature, personal and professional experience.

Theoretical sensitivity was developed mainly from the literature and the researcher's personal and professional background: for instance, theoretical sensitivity was enhanced by conducting a general literature review on ERP/IS in organizations and understanding all issues relating to ERP/IS. It was also important to revise the research questions and determine the research approach, choose an appropriately accessible site or case, tools and techniques, as well as establishing an overall appropriate research design for data collection and analysis.

At the beginning, the literature review also assisted in the generation of a tentative framework as an initial step towards designing interview scripts for the first set of interviews (King, 2010). In addition, the literature continued to develop contextual sensitivity, as discussed in Section 2.1, which refers to understanding the research context, such as the nature of decision makers and management in Saudi HEI. This was very important in the early stages of the project. This contextual sensitivity assisted in the choice of cases and groups. It was not only fundamental at the onset of the project but also during the whole process of constant comparison and theoretical sampling.

The personal and professional background of the researcher is considered as a second source of meaning in this research, playing a role in enhancing both theoretical and contextual sensitivity. Instead of depending on the literature to enhance such sensitivities, the researcher employed all the knowledge and experience she had gained over the years to bring the required knowledge values to her study. This experience came from the researcher's Master's dissertation, since she had worked in the same field of information systems and studied ERP systems in business organizations. This realization also emerged from her professional experience within the Saudi HE sector.

Furthermore, after the emergence of the theory at the end of this project, an additional literature review was carried out to confirm the research findings and identify where the literature was incorrect or overly simplistic (Strauss & Corbin, 1998). It also achieved theoretical integration, understood as the need to compare conceptual units and the data of the emergent theory in this research with other theories in the same field, and with developed theories outside the information systems discipline, as explained in Section 5.2 to 5.4. This process of comparison is considered to be an important stage in the grounded theory approach and obligatory for grounded theorists in information systems (Strauss, 1987, p. 282). The process of comparing and integration contributed to the generation of a substantive theory that will be transferable rather than generalizable, being both robust and flexible.

3.6.1.2 Literature review areas and strategies

Different areas of ERP studies were reviewed, including the challenges and difficulties of ERP post-implementation (as mentioned in Section 2.1), in order to enhance the theoretical and contextual sensitivity of the study. Since the researcher did not find many articles relating to ERP obsolecence, she decided to perform a more systematic

literature search aimed at identifying theoretical frameworks to guide the collection and analysis of data. After examination of these areas, it was noticed that there was no evedince of literature on this phenomenon, which led the researcher to visit the IS obsolescence literature instead. At that time, the retrieved articles could not be considered as a suffcent theoretical foundation for this project. Therefore, the researcher decided to examine furher literature on the product obsolescence, since an ERP is a product; this was done for the same reason identified earlier, namely that the existing literature was evaluated as being unable to provide a sufficient theoretical foundation to adopt as an a priori framework to guide the data collection and analysis.

In reality, this research could be the first study to investigate ERP obsoloscence. Thus, it is purely indicative and aims to produce an initial theory as the basis for future research. The final theory is more likely to emerge from and be grounded in the data. This also implies that GT should be adopted as the overarching research methodology to guide the data collection and analysis in a single case study design.

Following the process of the literature review, the investigator reformulated a tentative framework, owing to the fact that it was not possible to find an all-encompassing theory with the explanatory power to account for all examined phenomena. Despite this, a series of theoretical constructs were generated as a consequence of the processes of sensitisation, both theoretically and contextually. As argued by Strauss and Corbin (1998), theoretical constructs of this kind are employed in order to develop interview scripts after the initial information points are collected.

Once the literature review had been completed, the ascertained constructs were connected and classified for the purpose of creating a tentative framework. This framework was subsequently used as the ground on which the generation of the initial interview questions would be based. In line with the recommendation of the researchers Strauss and Corbin (1998), the form was utilised solely for the first interviews but it also functioned as a basis for information collection.

One should not overlook the importance of underlining that the tentative framework is entirely distinct when considered in relation to an a priori framework, which functions as the ground for the formulation of a theory. The tentative framework was first determined after examining the IS/ERP research in combination with publications from alternative areas, including manufacturing. Furthermore, the issues that were determined were used solely in order to formulate the preliminary lines of interview

questioning. See Section 3.6.2.3.1, for further information regarding the interview questions and the interview script.

It is also worth noting that the processes of information analysis and theory generation were largely unaffected by the tentative framework. This can be attributed to Strauss and Corbin's (1998, p. 51) explanation, in that, following the completion of the initial interviews or observations, a researcher naturally focuses their attention on the conceptual notions and questions that can be derived from an examination of the information.

3.6.2 Step Two: Data collection phase

In relation to the second stage of this project shown above in Figure 3.5, this section introduces and discusses data collection methods, sampling techniques and supporting tools for data collection.

3.6.2.1 Selection of data collection methods

Social investigations are conducted via two main types of research: quantitative research and qualitative research. A quantitative approach refers to the formulation of hypotheses about a particular investigation, in order to effectively answer the research questions systematically and procedurally (Hirschi, 1973). It specifically involves the measurement and analysis of causal relationships that exist between certain investigable variables (Denzin & Lincoln, 2000). Statistical analyses are possible with quantitative data, which means that it is a powerful and substantial method of assessing theories (Hirschi, 1973). Qualitative research, however, involves researcher-based observations on processes. There is an element of interpretation and practice that surrounds qualitative research (Denzin & Lincoln, 2000). It stems mainly from the idea that reality is fundamentally structured in nature; therefore, relationships within this system can be effectively studied (Denzin & Lincoln, 2000). Research by Dey (1996) explained how qualitative research involves an element of subjectivity, yet ultimately provides more detail and depth compared to quantitative research.

Qualitative and quantitative research methods can be used in conjunction, in order to answer research questions effectively. The approaches both have their own advantages and disadvantages. Quantitative data can be used to provide objective information, in a systematic, analytical and comparable method (Punch, 1998). However, qualitative

information is more applicable to a variety of different situations and circumstances, due to its flexibility and dynamism.

With regards to the research questions and objectives that have been proposed for this study, qualitative methods have been decided upon as the most appropriate. Firstly, the study requires the development of a theoretical framework to understand the phenomenon of ERP obsolescence in HEIs in Saudi Arabia, specifically through the adoption of an inductive approach. There is no element of statistical analysis in this research. Additionally, the study takes an interpretivist perspective, in order to collect information and meanings for a data set. Also, GT will be applied to this research, which involves some type of qualitative element. According to Bryman (2001) and Pickard (2007), qualitative research studies mainly employ four qualitative data collection methods, namely, observation, a focus group, documentation and interviews.

3.6.2.1.1 Observation

There are two main methods by which observation can be conducted: participant observation and structured observation. The former involves the inclusion of the researcher in the subject being observed, whether that refers to a group, population or community. The researcher is able to develop a shared understanding of the subject, creating a better sense of awareness (Gill & Johnson, 1997). Structured observation, however, is systematically designed and involves an investigation into the frequency of events or occurrences, as opposed to an investigation into their justification and reasoning (Saunders et al., 2003). Participant observation takes a qualitative approach, which assesses the reasons behind an occurrence, whereas structured observation takes a quantitative approach, where the method of occurrences is understood (Saunders et al., 2003). This study could not operate effectively through either of these observational methods; both are unsuitable for the design of this research because observation is usually selected as a research method to obtain a close-up view of the phenomenon experienced in a particular context. In this study, the ERP had already become obsolete and been replaced, which means that observation would be meaningless.

3.6.2.1.2 Document analysis

An essential element of the triangulation of data is document analysis: the process of analysing text-based information. Often this is made easier by processing the text

through qualitative data analysis software. Document analysis enables the researcher to broaden the field of research and make links between the spoken interviews and the research questions at hand. Document analysis makes use of a different skill set to interviews, as many texts use specialist terminology (Thomas, 2011). Document analysis is necessary in almost every field of research (Yin, 2009), and can encompass a range of media, including electronic and paper correspondence, formal files and records, and other research studies conducted on the same or similar topics.

3.6.2.1.3 Focus group

According to Morgan (1998), a focus group is practically a focused interview with a group of people. However, the value of the responses is not related to individuals but rather to participants. He added that focus group interviews are powerful either as "a self-contained means of collecting data or as a supplement to both quantitative and qualitative methods" (p.10). Accordingly, Krueger (1994) defined a focus group as a "carefully planned discussion designed to obtain perceptions on a defined area of interest in a permissive, non-threatening environment" (p.45). Stewart and Shamdasani (1990) identified the advantages and disadvantages of the use of focus groups as follows:

Table 3.1: Advantages and disadvantages of the use of focus groups (Stewart and Shamdasani, 1990)

Advantages	Disadvantages
- The research procedure is socially developed; - A flexible format gives the researcher sufficient space to examine unanticipated issues; - Cost-effective with quick results; - Enhancing the size of the sample requires minimal time and resource investment.	- Control over the experiment is lower; - Data is more complicated for analysis; - Focus group interviewers must be highly skilled; - Challenges with groups (e.g. some groups can be difficult to assemble); - Environmental challenges (e.g. interviews must be carried out in places that allow group conversation).

For the purpose of this study, a focus group has not been used, for the following reasons:

- Logistical difficulties.
- Stakeholders' timescales were different to the researcher's.
- It is impossible to conduct focus groups through video conferencing, due to governmental and cultural restrictions.
- It was unlikely to succeed, due to the loss of candour because of the sensitive nature of the research topic, alongside issues related to decision making and the inability to build trust among participants. Instead, individual telephone interviews were more applicable in this case. Hence the focus group method was excluded from the possible methods to be used.

3.6.2.1.4 Interviews

Kahn and Cannel (1957) explained how interviews involve purposeful discussion between two people, often applied in the social sciences. According to Robson (2002), there are three main types of interview. The first is a fully structured interview, with the use of predetermined questions and specific wording, arranged in a given order. Open-response questions separate this method from an interview-based questionnaire. Semi-structured interviews involve the use of predetermined questions, which can be reordered and reworded, depending on the discretion of the interviewer. Explanations can also be given, as well as effective omission or inclusion of additional questions (Robson, 2002). Unstructured interviews refer to cases where the interviewer has a general understanding of a topic, but remains open to new interpretations and topics of discussion (Robson, 2002). Saunders et al. (2007) and Bryman (2001) identified three different types of interviews, as follows:

1. Structured interviews which aim to answer predesigned questions; the interviewer will only ask the set questions, which reduces the flexibility of this technique.

2. Semi-structured interviews have a more flexible structure, which allows more free space to insert more probing questions into the main structure of the interview questions.

3. Unstructured dialogue interviews are not predetermined by any predetermined interview questions. This type of interview gives the researcher more freedom

to extract ideas, but it requires the researcher to be very aware of the main core of the interviews.

In addition, interviews can be either face-to-face or one-to-many. The current literature recommends the use of technology to conduct interviews, hence telephone, internet or video link interviews have become common in research studies (Myers & Newman, 2007)

3.6.2.1.5 Selected data collection methods

As mentioned in Section 3.5.5.4, the researcher in this study chose the case study as the main methodology and GT as a complementary approach. Each method has its advantages and disadvantages, so adopting a combination of both methods was helpful in achieving the objectives of this research and answering the research questions. The case study methodology can provide a proper research design and case boundary to collect the data from a context that is not provided for by GT. In contrast, GT provides a systematic approach to data collection and analysis not provided by the case study. Thus, the data was collected, analysed and presented in light of GT. Semi-structured in-depth interviews were conducted and documented, and also examined as a data collection method, as these techniques are commonly used in IS research (Saunders et al., 2003, 2007; Yin, 2003; Oates, 2006), as is typical of qualitative data research. This required the researcher to conduct an in-depth investigation using a large volume of qualitative data from different sources, as more than one source of evidence is often used within a single case study (Cavaye, 1996; Sunder et al., 2003; Yin, 2003; Punch, 2005; Oates, 2006). The advantage of employing multiple methods is that it enables the researcher to make use of data triangulation (Saunders et al., 2003, 2007; Yin, 2003; Oates, 2006). The purpose of triangulation is to ensure the validity of the data. It can also help in bridging gaps in the data collection process (Pettigrew, 1985).

In the social sciences, the interview is a typical research method. The approach to the interviews may vary, depending on the complexity of responses required. While a semi-structured interview may start with a set list of questions, the interviewer may allow digressions, if they deem it suitable and relevant.

Prior to conducting the interviews, the researcher went through different stages, as is shown in Figure 3.5.
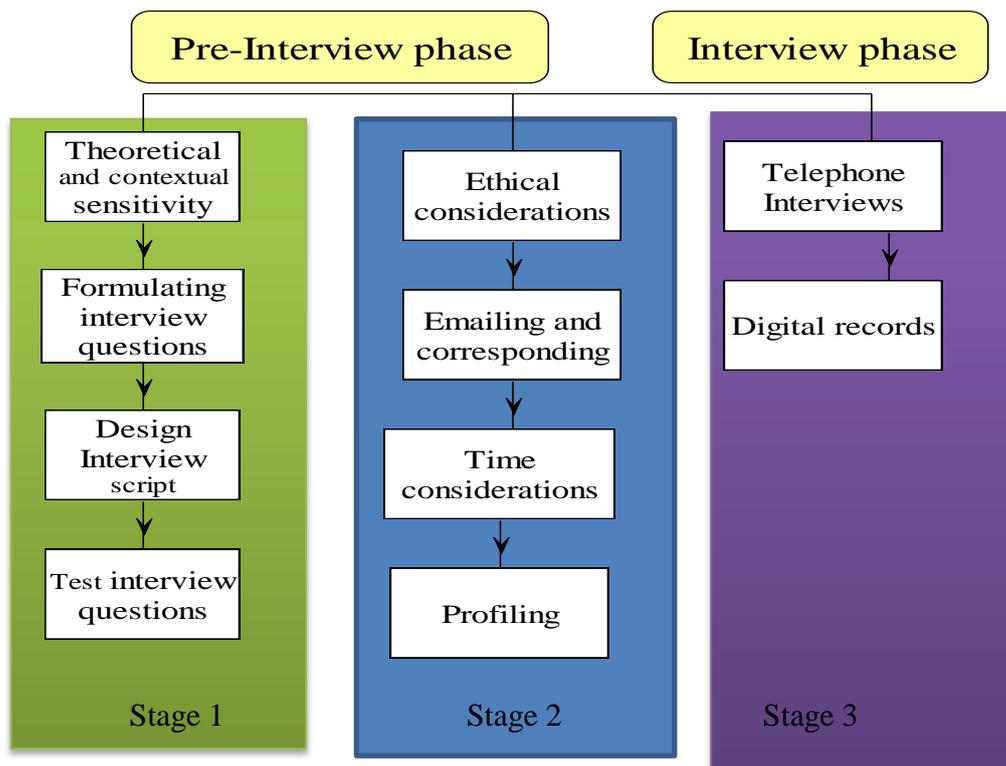
Figure 3.5: Interview stages

The above figure shows that the pre-interview stage consisted of two different stages. The first stage began by ensuring theoretical and contextual sensitivity, and then formulating the interview questions, followed by designing the interview script (to be discussed in Section 3.7.2). The researcher then tested the interview questions with colleagues and supervisors. In the second stage, the researcher began by gaining ethical approval from both the University of Sheffield and the case study university for this research (see Section 3.8), then contacted potential participants by email and sent the consent form (see Appendix 8) and timeframe agreement. After this, the researcher started looking at participants' profiles on the university website, Twitter and LinkedIn to gain general knowledge about their interests, which was a very helpful strategy for engaging with the interviewees. The interviews were conducted by telephone and recorded digitally.

Due to restrictions imposed by Saudi culture which prohibit women from accessing men's departments, telephone interviews were arranged to overcome this problem. Block and Erskine (2012) have observed that using telephone interviews as a form of data collection is becoming increasingly popular. However, various scholars have criticized this as a method of qualitative data collection (Rubin & Rubin, 1995 as cited

in Irvine et al., 2012; Legard et al., 2003; Gillham, 2005), on the basis that the absence of face-to-face conversation has an impact on building up rapport, as well as on generating a "natural" atmosphere.

Despite these criticisms, there are benefits to using the telephone interview, such as saving time and reducing travel costs; it has been estimated that this method results in a reduction of 50–75% of costs, compared to face-to-face interviews (Marcus & Crane, 1986; Worth & Tierney, 1993 as cited in Block & Erskine, 2012). Additionally, the anonymity level required increases in proportion to the level of sensitivity of the topics (Chapple, 1999; Kavanaugh & Ayres, 1998; Sturges & Hanrahan, 2004 as cited in Irvine et al., 2012). Therefore, it is not rare for qualitative data to be collected via telephone interviews.

Additionally, Block and Erskine (2012) have argued that the telephone interview is more time efficient. Groves and Kahn (1979, cited in Block & Erskine, 2012) noted that telephone interviews take approximately 30 minutes to complete, compared with 50 minutes for a face-to-face interview, which means that the amount of time saved can be near to 50%. Moreover, fewer personnel are also required for this method (Miller & Salkind, 2003, as cited in Block & Erskine, 2012).

Due to these advantages, this study utilized telephone interviews; the researcher recorded all interviews electronically. In addition, the researcher took personal notes and used them to inform her questions in further interviews. Charmaz (2002) highlighted the need to ensure that there are no discrepancies between the information recorded and the theoretical outcomes. The interviewer carefully followed the thread of the interviews and related the participants' explicit or implicit disclosures to the overarching themes of the research exercise. Nevertheless, the spoken content of the interview remained the primary source of analysis. Before analysis could begin, the researcher ensured that the transcribed interviews were translated from Arabic to English.

3.6.2.2 Sampling technique

Selecting the target sample is critical, requiring an appropriate and corresponding with the phenomenon under investigation to support the generalizability of the research findings. The sampling process in a grounded theory study is different from that in

quantitative research as the targeted sample cannot be planned in advance; however, the specific sampling decisions evolve during the research process (Stauss & Corbin, 1990). In this research the initial sample of interviewees was planned in advance. A purposive sample is a technique based on the characteristics of a population and the objectives of the study. According to Palys (2008), this type of sampling can be very useful in situations where you need to reach a targeted sample quickly. The initial sample consisted of the decision makers involved in both the previous and the new ERP system.

As the research progresses, categories and concepts inevitably begin to emerge. At this stage, it was appropriate to implement theoretical sampling, which is the process of identifying categories as they develop, and honing the sampling method to discover the true magnitude and complexity of these themes (Strauss & Corbin, 1998: 73). Knowing that GT aims to develop a theory that is "grounded" in the data from which it has been derived through a process of induction (Glaser, 2002), the sampling is therefore theoretically oriented. This is because it is more likely to be led by the development of conceptual theory as opposed to creating a descriptive account.

Strauss and Corbin (1998) defined theoretical sampling as "maximis[ing] opportunities to discover variations among concepts and to densify categories in terms of their properties and dimensions" (p.201). From Charmaz's (2006) perspective, it aims to focus on data collection and increases the analytic abstraction of theory by illuminating variations and identifying gaps that require elaboration. Interviews should cease after saturation is reached, which is the circumstance in which no significant new codes emerge. The theoretical saturation will be explained in Section 3.7.3.4.

Subsequent interviews were organized based on the results of the first round of investigations and the codes that arose, so the interview questions changed depending on the data collection process and analysis. Each interview was analysed separately so that the codes could be used in the following interview, so the research questions evolved with each step. During the interviews, it was found that management staff also impacted the decision-making process in different ways. Therefore, the researcher started to conduct interviews with different managers from different departments. This generated some conflicts in the data from the previous set of interviews, so new codes were identified in order to explore the reality of these conflicts, as is the case with theoretical sampling. The researcher included IT staff in the interview process, focusing on questions related to IT at the beginning of the interviews, and then moved on to

involve different codes from other departments in order to measure the perceptions and level of conflict between different departments. For instance, in an interview with IT staff, the researcher started the interview with IT codes obtained from earlier interviews, then included the other codes taken from managers to get closer to the reality.

The data collection at the case study site involved 17 interviews with two key decision makers, eight managers and seven IT staff; each participant was assigned a code for anonymity purposes.

Table 3.2: List of participations

Participant	Participant code (interview number (N)-interviewee ID)	Position at the university
1	**N1-DM1**	**DM1:** Decision maker ERP 1 (previous ERP) and project manager
2	**N2-DM2**	**DM2:** Decision maker ERP 2 (new ERP and project manager
3	**N3-D**	**D:** IT director
4	**N4-M**	**M:** Financial manager
5	**N5-M**	**M:** Purchases manager
6	**N6-M**	**M:** Warehouse manager
7	**N7-M**	**M:** Inventory manager
8	**N8-SD**	**SD**: Systems director
9	**N9-M**	**M:** HR manager
10	**N10-D**	**D:** Director of financial application management and administration
11	**N11-IT**	**IT:** IT programmer
12	**N12-IT**	**IT:** System analyst
13	**N13-M**	**M:** IT manager
14	**N14-IT**	**IT:** IT programmer and analyst
15	**N15-IT**	**IT:** Technical support officer
16	**N16-IT**	**IT:** Technical support officer
17	**N17-IT**	**IT:** IT staff

3.6.2.3 Data collection tools
3.6.2.3.1 Interview question script

Throughout the theoretical and contextual sensitivity, the tentative framework and the interview questions were developed. It is imprtant to mention that this framework had very little influence on the data analysis and theory development, since "after first interview(s) or observation(s), the researcher will turn to questions and concepts that emerge from analysis of the data" (Strauss & Corbin, 1998, p.51).

Therefore, the interview scripts were constantly evolving with the processes of data collection and analysis. The initial version, together with all documentation offered to the informant, was subjected to ethical review and approved by the Information School at the University of Sheffield, as discussed in Section 3.8.

Moreover, the utilisation of an interview script offers a variety of benefits. The script incorporated a series of parts, with each part containing a range of open-ended items that could point the interviewer in the right direction to acquire useful information for theory generation. Questions of this kind, along with the approach, enabled participants to relate their perceptions and attitudes towards the topic in a free and open manner. It is also notable that a series of follow-up questions were connected to each open-ended question, thereby enabling the interviewer to heighten the quality and quantity of the information derived from the response. The follow-up questions were also useful, insofar as they provided an indication to the participants of the level of detail required in their answer.

The interview scripts were written in both English and Arabic. The reason for the English items was to let the researcher know about the rationale behind all of the questions being asked, and the Arabic versions detailed the precise wording and content. In terms of the layout of the script, places for note-taking were integrated into the script, lowering the likelihood of miscomprehension and simultaneously allowing the researcher to record relevant details. This provision was included on the basis of the recommendation issued by Easterby et al. (1991). In addition, this helped the researcher to check participant attitudes and opinions and, furthermore, to facilitate revisions and extensions of answers where desirable (see Appendix 1) for the full interview script used in the preliminary stages of the study, and an example illustrates in Figure 3.6.

Figure 3.6: An example of the interview script design

3.6.2.3.2 Digital recorder

A critical matter is to create complete, fair, and accurate recordings of the interview proceedings (Patton, 2002, pp. 380-381). The rationale for this is presented as follows:

1) With the knowledge that a comprehensive record of the interview is being kept, the interviewer can focus less on note-taking and more on information collection.
2) A comprehensive record of the interview functions as the ground on which systematic analysis can subsequently be carried out.

In view of these reasons, a digital recorder was switched on for the length of all interviews conducted in this study.

Nevertheless, it should be acknowledged that, as highlighted by Bryman (2008), participants can be perturbed about the prospect of being recorded. This can have an adverse effect on the information that is collected due to their degree of openness and, therefore, several ways in which to mitigate this were adopted in this research. Initially, at the start of each interview, the interviewer explained as follows:

"Your participation is potentially meaningful and greatly contributory to this study. Therefore, would you mind if I record our conversation? The recording will be kept strictly confidential and will only be used by me for the research purpose

only. You can stop the recording for any reason, whenever you feel uncomfortable."

مشاركتكم يحتمل أن تكون ذات مغزى والتي تساهم إلى حد كبير في هذه الدراسة. لذا، هل تمانع في‟

أن تسجل حديثنا؟ وستبقى تسجيل في سرية تامة وسوف تستخدم فقط من قبل لي لغرض الأبحاث فقط.

.‟ يمكنك إيقاف مسجل، لأية أسباب، كلما أو ما كنت تشعر بعدم الارتياح

The result was that all the interviewees agreed to the use of the digital recorder. The interviews began with some irrelevant and light conversation, such as:

"I have seen your profile, it is "Mashallah"; you have a lot of achievements in ERP systems."

The interviewees started to engage and talk to the researcher when she showed her awareness of their achievements. This strategy helped the interview participants to get used to the interview atmosphere and to ease the discomfort caused by the presence of a digital recorder. Thus, the participants could be more at ease and provide more truthful and meaningful information.

The data were transcribed and thoroughly analysed in Arabic immediately after the interviews; then there was a need to translate the collected data back to English. The following section will address the translation issues in more detail.

3.6.2.3.3 Translation and terminological ambiguities

In this research study, there are two translation concerns; the first is related to the interview script and the second is related to the interview transcription. This section will address the translation issues with the interview script first, followed by interview transcription translation issues.

As a large percentage of the respondents were not English speakers, a further challenge for the researcher was that interviews would have to be conducted in their native language, Arabic. However, it is frequently more productive to conduct interviews in the respondents' native language, as the resulting data is more robust (Marshall & White, 1994). To achieve this, the interview script was translated and interviews were

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conducted in Arabic. This presented additional challenges for the project, due to the possibility of errors or inaccuracies arising from the translation of the interview script from English into Arabic, and then in translating the Arabic responses back into English for analysis and reporting the findings in this thesis. Fortunately, as the primary interviewer for this project was a native Arabic speaker, the potential problems arising from this complex process were significantly reduced.

This process could have been simplified by designing the interview script in Arabic from the outset. However, in order to ensure the necessary level of theoretical sensitivity (Strauss & Corbin, 1990), the background research was conducted using literature published in the English language, and consequently the original interview questions, and the terminology used therein, was prepared in English.

The language used for the interview script was also governed by the language used by the research team. As the study was conducted at a UK university and all discussion and validation of the interview and interview script design took place there, it was entirely logical that the language used for the interview script should be English (Peng & Nunes, 2008). The success of any qualitative research project is governed by the effectiveness of discussion about, and review of, the data collection instrument, because grounded theory should, in the main, be a collaborative process (Corbin & Strauss, 1990). A key element of any research project is collaborating with colleagues who have experience of the area being researched, to test different ideas and how they relate to each other. As Corbin and Strauss (1990) note, this type of collaboration can help to remove prejudice or bias from the research and analysis, as well as uncovering new insights and improving the researcher's theoretical sensitivity. To facilitate the process of discussion and collaboration, the interview script and consent form for this project were developed in English, and then the final versions were translated into Arabic. As Peng and Nunes (2008) noted, the translation of any key research document needs to be carefully managed by the researcher as it is a complex process and, as Carlson (2000) observed, inaccurate translation reduces the reliability and validity of the resulting data, and can render the outcome completely meaningless.

In translating a research instrument from one language to another, considerable attention needs to be paid to linguistic and cultural differences (Carlson, 2000) and, as Peng and Nunes (2008) observed, it is crucial to avoid direct literal translation, as this frequently leads to clumsy sentence structure, rendering the text hard to understand.

One of the key linguistic and cultural challenges with any study of this nature is the issue of "emic" and "etic" concepts (Carlson, 2000), in that concepts and expressions which are well understood in one language and culture may not be relevant or understood in another. In the context of this study, concepts and expressions which we take for granted in English may not be understood when translated into Arabic. It can, for example, be difficult to translate Western "emic" terms such as "individual differences" and "self-concept" into another language, because the concepts may be confusing in the context of another culture (Pratt, 1991). As has already been noted, the quality of the translation of a research instrument from one language to another is directly related to the quality and validity of the data obtained with it (Carlson, 2000). Thus, as Harkness and Schoua-Glusberg (1998) and Carlson (2000) have noted, the aim in translating any research instrument for cross-cultural projects is to ensure that, instead of a literal translation of the original, the translation is conceptually equivalent, and is as clearly understood in the new language as the original, to ensure the validity of the data (Peng & Nunes, 2008).

Because the principal investigator in this project is bilingual, translation of the research instrument into Arabic could be done internally. To reduce errors and potential confusion in the translation, the current terminology relating to ERP was checked in academic papers from Saudi Arabian sources published in Arabic, ensuring that the terms used in the translation were relevant and generally understood. The translated script was then validated through a pilot study using a small group of Saudi researchers, and their feedback was used to make refinements to the final script.

Throughout the data collection and analysis, the interview script was developed after each interview; it is worth noting that the refinement of the research script was an iterative process, as changes in one phrase could affect other parts of the script. Any change was carefully analysed and the implications for trigger questions and follow-up questions were considered, to ensure that comprehension of the questions remained consistent. An equal amount of care was used with further refinement of the script at various stages during the process.

Interestingly, some of the phrases,, such as the term "replacement", were not used by the interviewee since they used re-implementation or upgrade, whereas in IS research the term does not have the meaning of replacement. As each of these phrases has its own meaning and activities, this led to a careful analysis and rephrasing of each of the

questions, trigger questions and follow-up questions, and the researcher made sure of the meaning of the phrase by confirming the participants' answer with further explanation in questions in the script. It should be noted that a similar process of careful question design was undertaken as the script evolved during the different stages of the process.

It was mentioned above that the translation of the interview script from one language to another is a complex process which requires much attention; similarly, the translation of qualitative data may be much more difficult than that of an interview script, because the content of a script or instrument is limited compared to the data collected from qualitative research. Therefore, the translation of the full set of interview transcripts can be too difficult and time-consuming. More importantly, Tiwnn (1997) claimed that the original meaning of qualitative data may often be relatively lost after such translation.

Ultimately, the principal investigator and supervisors concluded that the most effective course of action would be for the data to captured, coded and analysed in Arabic, with the findings reported in English in order to be quoted in this thesis and in further future publications. There were two advantages to this approach:

1. As Carlson (2000) and Twinn (1997, 2000) have observed, translation of data between two languages carries many potential difficulties. As discussed earlier, these can include differences in interpretation of responses and linguistic differences resulting in a lack of conceptual equivalence, as well as the fact that, if the subjective interpretations of the translator are included in the translation, the meaning underlying the original qualitative data may often be altered after the translation. By capturing, coding and analysing the response data in the same language (Arabic), these potential problems were minimized to ensure that the data was not compromised and the accuracy and validity of the findings was protected.

2. Translation of responses prior to analysis would break the relationship between data collection, analysis and interpretation. In contrast to quantitative research, in which there is a distinct separation between data collection and analysis, in qualitative research there is a close (ideally simultaneous) and dynamic relationship between the two parts of the process (Esposito, 2001), and it is important that this is preserved. Furthermore, as Marshall and White (1994) observed, the entire project could be compromised by translating pre-analysis, as key nuances and underlying

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trends may be "lost in translation" if responses are only analysed after they have been translated from the original language. These nuances and underlying trends can have a key impact on how the research data is interpreted and on the project's ultimate findings. Therefore, the researcher decided to carry out the data analysis process (coding) in the original data collection language (Arabic), instead of translating the whole set of interview transcriptions. After all codes, categories and sub-categories were identified, the selected gustoes were translated to English. In that sense, this method could help to minimize errors and misinterpretations of data. It also could improve the quality of data and enhance the trustworthiness of the research findings.

3.6.3 Step three: Data analysis phase

Data analysis is the phase that is initiated once the researcher has developed an intimate comprehension of the gathered information. The outcome of this phase is the generation of an underlying theory (Pandit, 1996). As stated by Strauss and Corbin (1990), one of the implications of approach employed for data analysis is that the benchmark of the researcher's experience can serve as an important indicating factor regarding a possibly successful research process.

For the purpose of generating GT, the researcher facilitated a comprehensive and episodic data collection procedure accompanied by continuous comparative analysis. The ultimate outcome being theory generation, this approach enabled the collected information to be abstracted to a growingly great degree over time. It is notable that this approach to the derivation of a theory from collected information has been precisely delineated and linked to closely examined methods in the extant literature. This serves as a manifest delineation of the GT methods, characterised by their centrality with regard to a range of qualitative data analysis approaches. It is important to acknowledge the way in which a number of disputes exist regarding the process of data analysis in GT (Boeije, 2002). Furthermore, the absence of a systematised strategy has facilitated analytical creativity (Strauss & Corbin, 1998) and, for researchers who lack extensive experience, this can often result in confusion (McCaslin & Scott, 2002). Depending on the study, varying data analysis methods are explicated (Scott & Howell, 2008), but numerous researchers have recommended that the standardisation of the analytical process should be facilitated (Boeije, 2002; McCaslin & Scott, 2002; Scott, 2002; Suddaby, 2006).

One of the most important features of the GT method formulated by Strauss and Corbin (1998) is that it offered researchers a linear guiding procedure that, if conformed to, would facilitate the generation of a viable theory. Such a theory would display the important features of generalisability, reproducibility, accuracy, comprehensiveness, and verification. Strauss and Corbin (1998) defined GT as facilitating the derivation of a theory from information that has been collected and subject to analysis in a systematic manner over the course of the research process. Given that it is a theoretical framework that has arisen from incremental development, a range of analytic strategies to GT have been formulated and employed, and these follow on from the establishment of the first research questions and data collection. The analytic strategies are as follows:

1) The Coding Strategy;
2) The Memoing Strategy;
3) A Concept Map; and
4) A Table of Code Definitions.

In line with the researchers' Strauss and Corbin (1998) recommendations, the current study has utilised diagrams for the purpose of illustrating and explaining the axial coding and core categories. Data analysis commenced as the information collection procedures were initiated (as displayed in Figure 3.7). Consequently, the GT was subject to inductive development as a result of the combined implementation of each of the strategies, thereby satisfying four substantive measures: fit, control, generalisability, and understanding (Strauss and Corbin, 1990).

Figure 3.7: Cycle of data collection and analysis process towards the development of theory, adapted from Haloub (2013)

The diagram above shows the process of data collection and data analysis in GT, whereby the researcher moves back and forth between the data collection and parallel data analysis in order to ground the analysis in the data. The next section will explain the coding process that has been used in the analysis.

3.6.3.1 Coding process

Owing to the way in which coding facilitates the theoretical abstraction of information and, following the formulation of a theory, the information's reintegration, it is an

important stage in GT. It should be acknowledged that the coding process in GT is labour-intensive given the fact that a user must individually assess each line in the gathered information to identify the codes. In describing the coding process, Strauss and Corbin (1990, p. 57) stated that it can be regarded as the critical procedure on the basis of which the construction of theories takes place from information; in this way, it denotes the activities which are involved in the deconstruction, conceptualisation, and novel reconstruction of information.

Moreover, the coding process is significant in serving as the foundation of theoretical sampling and comparative analysis. As stated by Creswell (1994), it is possible to gather useful information by employing assorted procedures in a variety of ways, and research goals impact the orientation of the information analytics and determination of the themes. In turn, this establishes the focus and the regions of comparison.

Silverman (2000) highlighted that certain information components are irrelevant when attempting to facilitate the achievement of research goals, and this is the case with this study due to the type of qualitative information and interviews that has been gathered. Nevertheless, in line with Knight's (2002) recommendation, it is critical that the researcher does not neglect the information; it ought to be coded in order to enable the clear differentiation of the significance of the study findings and contribution.

Humberman and Miles (1998) and Knight (2002) advised that one should mitigate against imprudence and hastiness when formulating codes and, moreover, that they should be organised simultaneously. In addition, the formulated codes that were irrelevant to the extant literature or the research assumptions have been periodically examined and assessed in relation to their thematic classifications, thereby ensuring fitness.

Following this, categories, sub-categories, and sub-sub-categories were created. Lastly, once the interpretive procedure referred to as selective coding was carried out, a theory began to arise (Glaser, 1978; Glaser and Strauss, 1967; Strauss and Corbin, 1990). However, the simultaneous handling of the produced information did not take place; as opposed to this, the produced information was set aside for a period of time over the course of the analysis and, when the time came to establish codes or categories, checks were made for inconsistent or irregular elements. Furthermore, for the purpose of assessing the extent to which they were relevant and suitable, the researcher revised the

coded transcripts on various occasions, thereby creating a chance to adapt and alter the research codes.

Distinct analytic types of coding have been identified in the literature: open coding, axial coding, and selective coding (Strauss and Corbin, 1998). The researchers note that one is not required to proceed in a sequential manner from one to the next, and the following part will provide an in-depth account of each kind.

3.6.3.1.1 Open coding

The first step of the GT analysis is open coding (Glaser & Strauss,1967; Strauss & Corbin, 1990). This type of coding is tied to determining and finding the category of specific phenomena as noted in the text, using a comparative method which reads and codes constantly (Scott & Howell, 2008). Boyatzis (1998) stated that the code is a title or portion of raw data that is able to offer a useful outcome related to the research phenomena. The researcher was able to pinpoint a number of codes in the data set, which have their own definitions, as noted in the figure below.

Codes	Definition of codes
Need to change technical environments	There was internal and external pressure on the university to change the technical environment to match the trend of information technology.
Remaining as leading national university by applying the latest technology	The university are worried about the university position, if they still use the previous system will be behind
Following global trend	The current global trend is SAP ERP, therefore, the university was willing to follow the universal trend.
Public image	The people in the university are worried about the university name from public, which The system caused delay in the work which affects their reputation in public and they will say their name in the newspaper.
Increased university size	The university wanted to add more users, add new modules, expand to multiple locations, have more functions and be accessible to new departments.

Figure 3.8: Example of code definition list

Figure 3.8 (as well as a sample shown in Appendix 2) notes that the coding definition list was taken on as a crucial way to complete comparative analysis, at a general level.

This way, an open code is distinctly shown, with regards to the code's meaning as well as its positioning. As a result, the emergent open code found in the data is contrasted with existing codes in the list, and their disparaities or common elements are underlined. The results of this comparison allows the researcher to combine this code with existing (similar) code, or establish it as a new code in the list. This procedure increases the theoretical value of the research project, and allows the researcher to push general descriptors and comprehend the creation of interrelationships as employed by the reseracher's analytical characteristics, which are thought to be the fundamental steps of creating GT. Furthermore, the code definition list can offer open code definitions, as well as show open code as they are tied to their categories and   sub-catgeories.

A quotation list was used alongside the code definition list, which noted all quotations tied to an open code. Figure 3.9 presents an example script:

List of quotations of sub-category of organisational obsolescence

Sub-category	Code	Quotation
Pressure on university	Increased university size	The university wanted to add more users, add new modules, expand to multiple locations, have more functions and be accessible to new departments.

"As the university improved, it increased its departments as well as its functions. As a result new changes were required; for instance the need of new employees and better quality was difficult due to the way the previous ERP had not been designed to match the new requirements and would cost the university more." (N2-DM2)

Translation :

كما تحسنت الجامعة، وزيادة أقسامها وكذلك وظائفه. ونتيجة لذلك تم إجراء تغييرات جديدة؛ على سبيل المثال كنت بحاجة إلى موظفين جدد وتحسين نوعية صحية بسبب الطريقة لم تكن مصممة مورد المؤسسات السابقة لتتناسب مع المتطلبات الجديدة وستكلف الجامعة أكثر من ذلك". (N2-DM2)

"All these changes needed heavy adjustments which the university could not handle; as we did not have enough professionals, including IT experts, software programmers and managers who were highly skilled to expand the system in a short period of time. The replacement was the option available to overcome these difficulties." (N7-M)

Translation :

كل هذه التغييرات اللازمة لتديات لاثقلة لتي لجمعة لا يمكن التعامل. كما لم يكن لدينا ما يكفي من المهنيين، بما في ذلك خبراء تكنولوجيا المعلومات، مبرمجي الكمبيوتر والمديرين الذين كانوا من ذوي المهارات العالية لتوسيع لنظام في فترة قصيرة من الزمن. كان الاستبدال خيار متاح للتغلب على هذه لصعوبات". (N7-M)

Figure 3.9: Example of quotation list

The figure above (as well as a sample in Appendix 3) shows that the quotation list is critical when contrasting data. Once a new quotation is highlighted through a certain

open code, it is compared with the current list quotations. When these quotations highlight different definitions, a new code should be used for this new quotation.

The list can offer evidence regarding English translation, meaning that the quotation list is necessary when creating the theoretical narrative, where the final theory uses suitable quotations from the list.

The open code underwent elaboration, refining and concluding for the findings within, and data which was alike was categorised under one conceptual label, in a process known as categorising. These concepts were composed into different groups which were connected via the results with regards to the relationships, in a procedure known as axial coding.

3.6.3.1.2 Axial coding

Axial coding is where the findings of connections amongst a category and its sub-categories brings about research category development. At this step, the researcher employed the concept map as an extra way of analysing open coding. Strauss and Corbin (1998) are in favour of using memos or diagrams to boost the data analysis process and to bring about the theory's evolution. Using diagrams is beneficial because of their visual nature, compared to the textual form of memos (Strauss & Corbin, 1998: 217). This study employed the concept map to assist the data analysis and to visualise research findings. Figure 3.10 depicts an example concept map:

The concept map was a beneficial way to analyse data, especially when it came to axial coding, as it offers a visual and specific showcase of the category, sub-category and cobcept links. This allows for a comparative analysis amongst sub-categories and categories. The results chapters include all the concept maps created, and their benefit to the theory production process is noted.
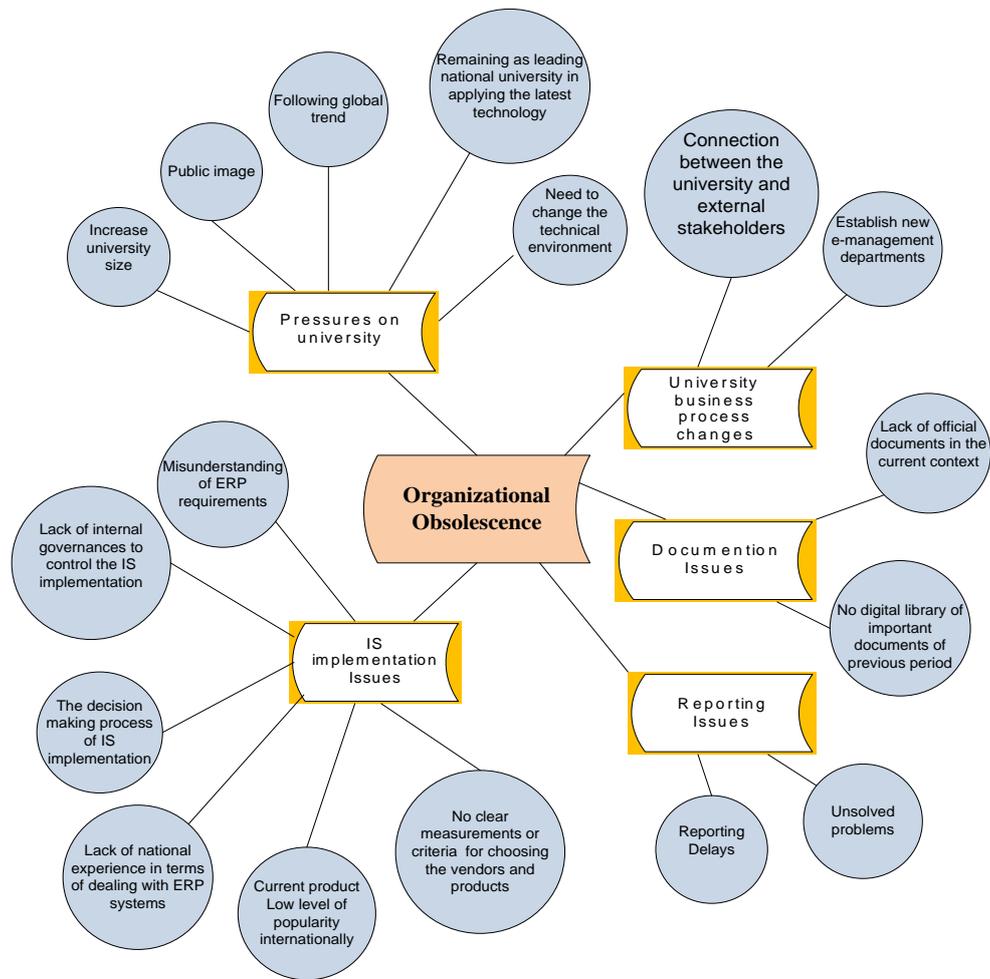
Figure 3.10: Example of concept map

The concept map was a useful tool for data analysis, particularly when practising axial coding, since it visually and explicitly demonstrates relationships between categories, sub-categories and concepts. It also facilitates the comparative analysis between sub-categories and categories. The findings chapters show all the produced concept maps and illustrate their use in the production of the theory.

3.6.3.1.3 Selective coding

Selective coding is the process of integrating the categories to create the initial theoretical framework or core categories. Strauss and Corbin (1990) felt that the core categories could be paralleled with the sun, surrounded by the solar system, where core categories are the key concepts or phenomena and are the basis for the production of theory. The storyline is descriptive of phenomena unqiue to a certain research, and it is a procedure of describing a research story and bringing it to life.

In this research project, the researcher was able to draw a set of concept maps to visualize and present the identified categories and core category. Two main concept maps emerged and were saturated through the coding process: internal environmental obsolescence and external environmental obsolescence. It was, however, recognized that each of these two main categories contained a large amount of codes and thus could not be clearly represented in one single concept map. Therefore, instead of creating a complicated diagram, the researcher established seven concept maps, with each covering one sub-category of factors leading to ERP obsolescence, (System Obsolescence, Organizational Obsolescence, Human Resources Obsolescence, Management Obsolescence, Policies and Restrictions Obsolescence, Competition from other HEs Obsolescence and Local IT Market obsolescence). Due to the complexity of the findings and the richness of interview responses, the researcher used a noticeboard in this process. This was a very helpful tool for data analysis, particularly when practising axial coding and selecting codes, since it visually represented all categries and explicitly demonstrated relationships between categories, sub-categories and concepts, as well as enhancing the evaluation of the emerging theory and making sure that all categories have groups of concepts and sub-categories (see Figure 3.11).

Figure 3.11: Concept maps used in the creation of the theory storyline

Furthermore, the above noticeboard helped identify the central phenomena or the core category of the theory of ERP obsolocence, out of the storyline writing process (see Section 3.12.).
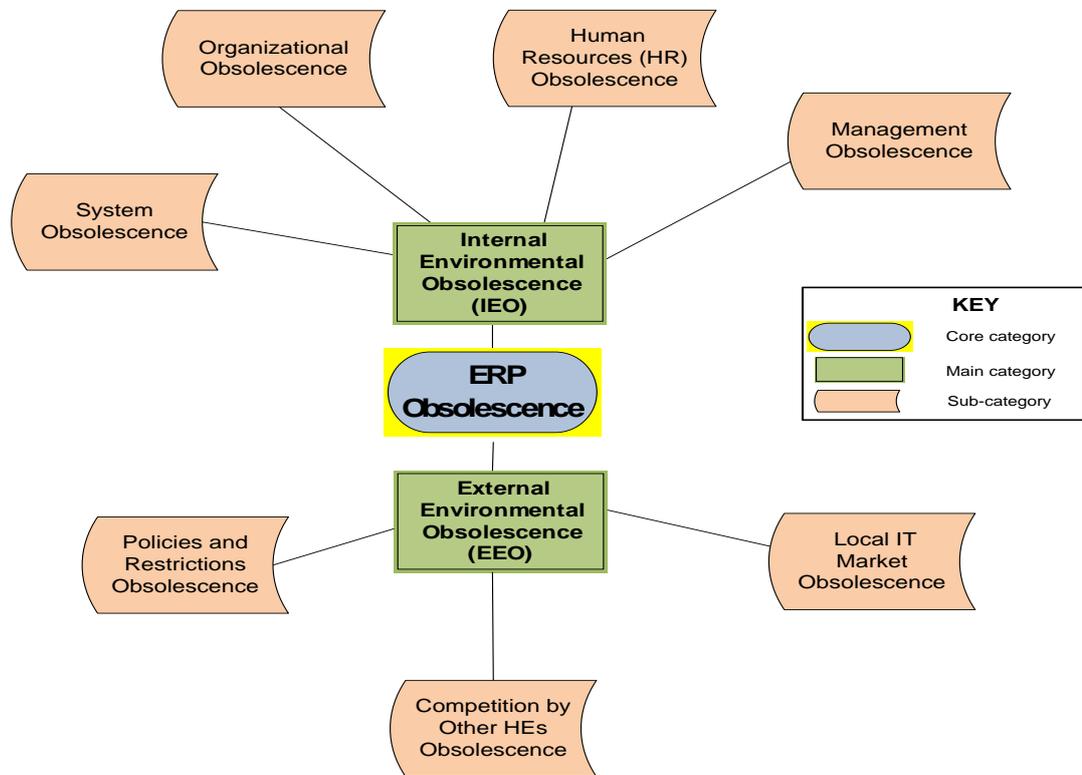
Figure 3.12: ERP obsolescence

3.6.3.2 Memoing

According to Dick (1990), memoing means theorising write-ups of notions about codes, concepts and sub-categories and their relationships. Memoing overlaps with ongoing actions which should be carried out by the researcher throughout the processes of data collection and data analysis. Clarke (2005) viewed "memoing" as the actual intellectual capital of any grounded research; hence, it should be recorded at the earliest possible time, because ideas are fragile. Therefore, writing a memo is not a trend but involves creating written records of a researcher's thinking during the process of undertaking a GT study. In this study, throughout the data analysis and process, memos were recorded, which assisted the researcher in providing a record of the theory development. This involved writing definitions of codes and categories and tracing their emergent

relationships with one another. Memos also helped in the process of theoretical sampling. An example of a memo will be provided in the figure below.

Main aspect .Interview DM2

ERP is understood as a system which can be used to manage, integrate and communicate different unites inside and outside an University experienced a few limited problems with ERP1,The university has regional and universal reputation

He thinks that the University used ready models because they wanted to reach to the top quickly, but with IS this cannot be correct because there are environmental needs must be taken in consideration
The university has different technical departments and professional departments, but none of them capable to supply the University with the required local experts.

Figure 3.13: Example of memoing

3.6.3.3 Constant comparative analysis

Constant comparative analysis is another key element of GT; it includes the constant comparison of event to event, event to codes, codes to codes, codes to categories, and categories to categories that aims to achieve concurrent data collection and analysis. There are two types of comparison: 1) incident-to-incident, in order to find similarities and differences among the available properties in order to classify them (Strauss and Corbin (1998). This is the most common type of comparison in both open and axial coding; and 2) comparison of abstract concepts in order to find similar or different concepts "To bring out possible properties and dimensions when these are not evident to the analyst" (Strauss & Corbin, 1998, p. 94). In this study, as mentioned earlier (Section 3.6.3.1), the researcher created a list of code definitions (code-to-code comparison) and then codes were applied to the textual transcripts of the interviews to achieve line-by-line analysis to extract concepts; hence, concept-to-concept comparison was carried out. At the end, comparisons between codes, concepts, sub-categories and categories were also carried out.

3.6.3.4 Theoretical sampling

Section 3.6.2.2 shows that the theoretical sampling approach was used in this undertaking, and was beneficial when it came to the researcher finding data sources to push the evolving theory development (Strauss & Corbin, 1998: 201).

3.7.3.4 Theoretical saturation

Theoretical saturation means that the data collection process should continue until it ceases to inform the data categories. This suggests the end of the data collection process and the beginning of the theory generating process. According to Strauss and Corbin (1998) researchers should be aware that there are no more possibilities for new or relevant ideas to be generated from categories and the categories are well developed, as well as the relationship among categories having been established and validated. In this study, theoretical saturation was recorded when: 1) extracting more codes from the data was no longer possible; 2) the concepts were defined and identified with no more chance of generating more concepts; and 3) the sub-categories were identified and formulated and the relationship between the sub-categories and categories fully checked and confirmed.
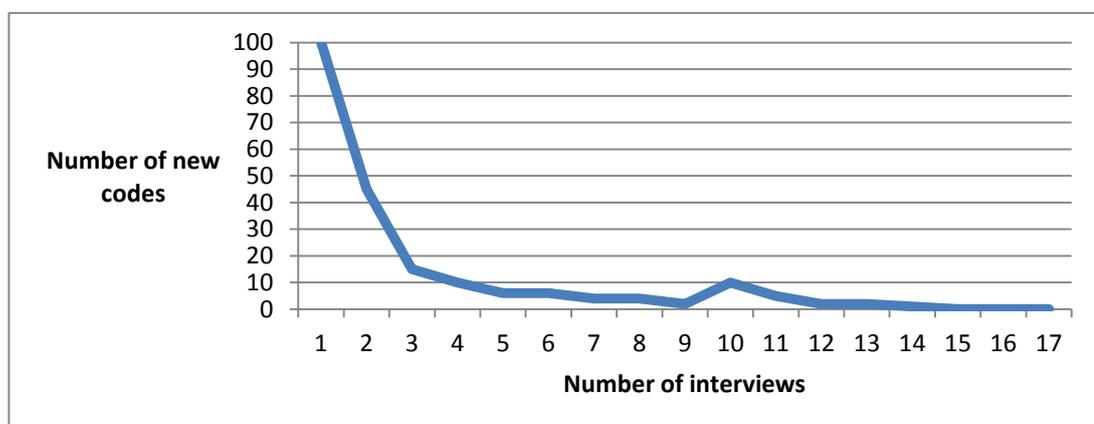
Figure 3.14: Data saturation

The emergence of new open codes increased in the first set of interviews and then the number of codes decreased until the ninth intervew. This is because of the similarities of the codes emerging from the interviews with managers and decision makers. Throughout the theoretical sampling, the researcher found that it was important to interview IT staff to gain further information in order to obtain a clearer picture of the current research phenomenon. After the tenth interview, new codes were continuously emerging until the thirteenth interview. Although no new open codes emerged in the fourteenth to fifteenth interviews, the process was continued until the seventeenth

interview in order to gain and achive a better degree of certainty and theoretical saturation.

3.6.3.2 Supporting tools for data analysis

In order to support the practice of coding and comparative analysis, two computer-assisted qualitative data analysis software programs, Nvivo (version 10) and Microsoft Word, were used interactively throughout all data analysis processes.

3.6.3.2.1 Microsoft Word

Perhaps the central programme in the Microsoft Office suite that is most conducive to efficiency is Microsoft Word, an application that facilitates the inputting of words into files of a reasonable size and, following this, exported and manipulated in accordance with user requirements. Computers do not have the capacities that would enable them to serve as adequate substitutes, but they can currently offer indispensable tools that enable researchers to process vast quantities of data into straightforwardly analysable reports (Strauss and Corbin, 1998; Walsham, 2006; Bazeley, 2007; Goulding, 2007; Bryman, 2008; Strauss and Corbin, 2008). Using Microsoft Word, it is possible for results to be viewed on paper or on an electronic device, and the application's features are enumerable. For the purpose of achieving the aim of this study, Microsoft Word has been employed in conjunction with NVivo.

3.6.3.2.2 Nvivo

Cohen et al. (2007) & Saunders et al. (2007) provide an overview of the range of commercially available qualitative analysis instruments that can be appropriately used for research. For this study, NVivo was identified as suitable, and it has been employed alongside Microsoft Word. As noted by Goulding (2007) and Cohen et al. (2007), tools of this kind lack the capacity to carry out independent analysis, but they are valuable when utilised to enhance the extent to which results are verifiable and, furthermore, when facilitating calculations that simplify the research process for researchers. Nevertheless, it is important to note that, as is the case with every computer application, the advantages that NVivo affords can only be accessed if the researcher possesses effective operational skills.

Despite the similarities between Nvivo and Word files, there are some advantages to using both in qualitative research. Each code and interview has the same code in both software packages, which makes cross-referencing straightforward. The combination

enabled the researcher to overcome the differences between them, as listed in the table below.

Table 3.3: The advantages and disadvantages of Nvivo and Word file

Nvivo	Word
Visualization of categories	Visualization of the whole
Only the codes	Can be printed
Not available	Transcription
Flexibility of analysis codes, concepts	Flexibility of analysis codes, concepts
Quotations in a different file	Flexibility in the use of quotations and translation
Memos in different files	Memos in the same files
Grouping and linking code elements	Comparative analysis
Helps to distinguish categories and sub-categories and generate new codes and sub-codes	Helps to develop interview questions
Efficiency in identifying data	Putting individual units of data back into context
Specific data units of meaning	
Arabic text problems	Accepts any languages

3.6.4 Theory development and storyline writing phase

The final developed theory and the overall storyline were reported in Chapter Four. According to Strauss and Corbin (1998), a storyline technique is used to aid the theoretical development by which the integration of theory during data analysis can be achieved. In this study, the storyline writing explained and described the central phenomenon by explaining the categories in relation to their sub-categories. In addition, codes were used which were supported by quotations from interview transcripts, and the relevant concept maps were used, drawing on the researcher's interpretation of the collected data.

3.6.5 Literature comparison phase

This represents the final phase of the GT inductive research, where the emergent theory was compared to those found in the existing literature in order to confirm the findings

and illustrate wherever the existing literature is incorrect or may only partially describe the phenomenon, as well as engaging with theories found in different disciplines (Strauss & Corbin, 1998). Therefore, Chapter 5 of this thesis compares and confirms the emergent theory of this research with the existing ERP obsolescence models and theories from outside the information systems field.

3.7 Validity, reliability and trustworthiness

Although Grounded Theory and the case study have formed the basis of many research studies in the area of Information Systems (IS), other types of qualitative research approaches have faced scepticism in terms of their validity, reliability and trustworthiness. For instance, some scholars conceived the outcomes of GT as a story which is told by researchers, without the presence of reliability and validity (Carcary, 2009; Urquhart, 2012). The questions which can be asked involve what validity, reliability and trustworthiness mean, and how the quality of qualitative research can be measured.

The notions of validity and reliability are used in quantitative research as major criteria to ensure methodological appropriateness. According to Cryer (2000), validity allows researchers to address what they claim to be measuring or explaining. He added that reliability demonstrates the quality of the data collection and technique. In qualitative studies Golafshani (2003) stated that the quality of qualitative research should be measured with respect to credibility (truth value), transferability (applicability), dependability (consistency) and conformability. Sikliaet et al. (2013) stated that, in qualitative research, the trustworthiness of GT research rests on its internal validity (credibility) and external validity (transferability), reliability (dependability) and objectivity. Nevertheless, Sikliaet et al. (2013) found it difficult to accept that these criteria always fit the needs of each paradigm. In Table (3.6), the researcher was able to collect the criteria suggested by different scholars to meet the needs of both qualitative and quantitative research.

Table 3.4: Criteria for measuring quality of research

Criteria for measuring quality of research				
Original Grounded Theory criteria, Glaser & Strauss, (1967)	Strauss & Corbin's criteria (1998)	Qualitative research criteria, Lincoln & Guba (1992)	Quantitative research criteria, Shedon (1994)	Grounded Theory criteria in IS, Sikolia et al. (2013)
Fits the research's needs; Works powerfully; Relevance; Modifiability	Research process; Empirical; Grounded findings	Credibility; Transferability; Dependability; Confirmability	Validity; Reliability	Trustworthiness; Internal validity (credibility); External validity (transferability); Dependability (reliability); Confirmability

From the above t, it can be seen that Sikolia et al. (2013) were able to clarify the criteria in more detail. They stressed that credibility, transferability, dependability and conformability are the dimensions of trustworthiness and they must work together to enhance the quality of trustworthiness of GTM research in IS. Sikolia et al. (2013) provided a list of steps to be followed to enhance the trustworthiness of GTM research in IS:

- Internal validity (credibility) requires engagement with participants, use of different data collection methods; validation of the interview scripts, concepts and categories from the participants; use of participants' own words in the emerging theory; a review of the case analysis; and peer debriefers.
- External validity (transferability) provides a clear and comprehensive description of the research process, including the data collection techniques and the accessibility of the field.
- Dependability (reliability) allows for the examination of a descriptive audit trail by an observer.
- Confirmability: as with dependability, the audit trail must be accessible for examination by a third party.

Sikolia et al. (2013) demonstrated that, without the adoption of the list of steps mentioned above, the trustworthiness of GT outcomes in IS research would not be fully assured. In this study, the steps suggested by Sikolia et al. (2013) were applied. In terms of the data collection method, semi-structured interviews, document analysis and social media (Twitter and LinkedIn) were observed. Information professionals and decision makers were engaged and the interview scripts and outcomes were shared with them to ensure agreement. Memos with descriptive and rich texts were recorded from the early stages of the research. Furthermore, during the process of category creation, the researcher was aware that the participants' actual words should be used in the emergent categories.

3.8 Ethical considerations

According to the UK's Social Research Association (SRA), good ethical practice in research is essential in order to achieve the following: (a) protection of research subjects; (b) ensuring high quality research; (c) reassuring funders; (d) helping to maintain the good reputation of the sector; and (e) complying with legislation (SRA, 2013). Consequently, in order to ensure that this research complies with the highest ethical standards, it incorporates a three-stage approach to upholding ethical considerations.

- *University of Sheffield*

In the first stage, the researcher followed the formal procedures of the University of Sheffield to gain ethical approval from the Information School to conduct this research. No data were collected without obtaining prior ethical approval from the university's Ethics Committee (see appendix)

- *Red Sea University*

The second stage involved the researcher contacting RSU in order to obtain written approval to conduct the proposed research. This stage also involved explaining the reasons behind conducting this research, and identified its objectives and the nature of the information required.

- *Research participants*

According to Bryman (2012), ethical principles in social research usually touch upon four main areas, namely (a) whether there is the potential of harm to the participants; (b) whether there is a lack of informed consent; (c) whether there is an invasion of privacy; and (d) whether deception is involved. Consequently, this fifth stage consisted of the

researcher ensuring that all these elements were sufficiently addressed. This included ensuring that all research subjects were sufficiently informed of the nature of the research; that they have been given enough time to consider the implications of the research; and that they have given valid, informed consent to their involvement in the research. Informed consent ensures that all participants are informed of their rights to privacy and what areas of privacy the research will impact on.

3.9 Conclusion

This chapter has set out the research methodology that has been used throughout the research investigation. The underlying interpretivist research philosophy has been explored, and the reasons behind the choice of an inductive research approach have been given. The choice of a combined case study and GT research approach has been set out in detail, and the advantages of this type of approach have been assessed.

In addition, this chapter has set out practical details relating to data collection methods and data analysis techniques, while the issues of validity, reliability and trustworthiness were also outlined. Finally, an overview of relevant ethical considerations has been provided.

Chapter 4: Research findings

4.1 Introduction and overall theory

This chapter aims to present the results of the research, beginning with a brief description of the overall storyline of the emergent theory (see Figure 4.1), following the principle of GT, as adopted in this research and discussed in the methodology chapter (see Section 3.6.2). The theory has been defined and articulated by Strauss and Corbin (1994) as: a set of codes that can be grouped and categorised into concepts and then into categories and sub-categories generated and derived from the study of particular phenomena. This study aims to generate a theory of ERP obsolescence in HEI in Saudi Arabia through understanding and developing the identified categories and sub-categories. It also sets out to clarify how these categories and sub-categories are characterised and grouped into identifiable types of obsolescence, and how these different categories are often interrelated, thus answering the research questions and achieving the research objectives.
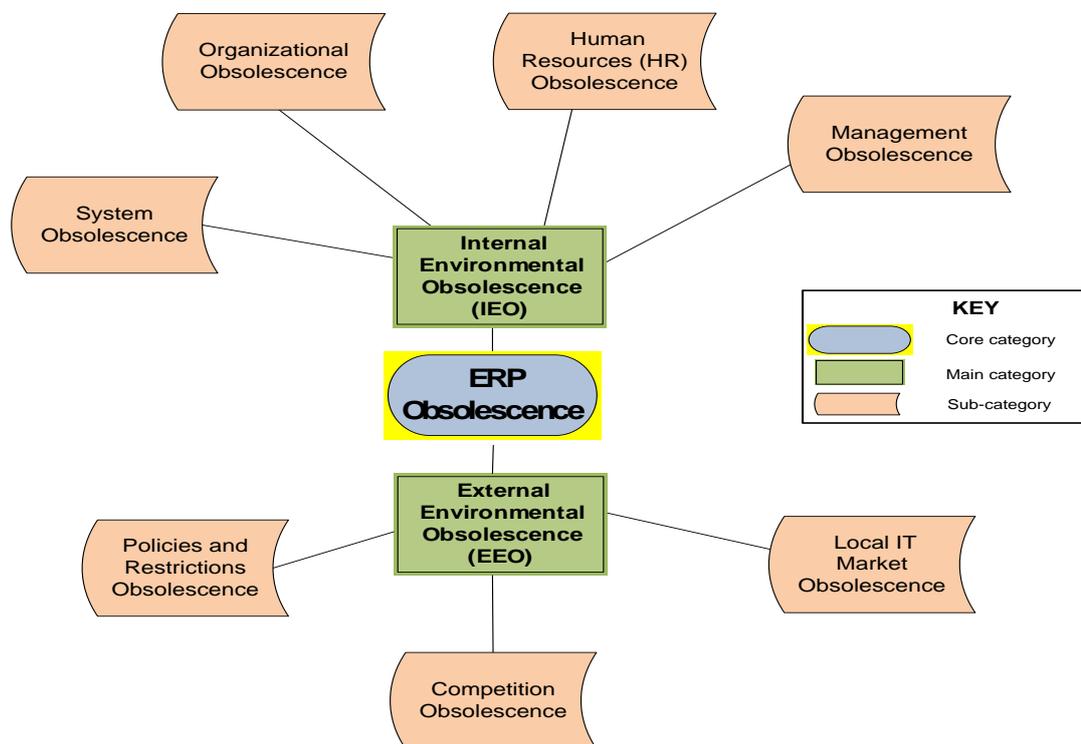
Figure 4.1: Emergent ERP obsolescence theory

The root causes of ERP obsolescence were perceived and saturated into two main categories, internal environmental obsolescence and external environmental obsolescence (see Figure 4.1), and so it was necessary to distinguish the two main categories and the interrelation between them, in terms of sub-categories and sub-sub-categories.

From the data, the researcher constructed a definition of Internal Environmental Obsolescence (IEO), which refers to the internal issues at the university boundary that can refer to people, systems, structures, attitudes and rules and decisions generally under its control and which had a direct impact on the previous ERP obsolescence. The four general factors of IEO were found to be System Obsolescence, Organizational Obsolescence, Human Resources Obsolescence and Management Obsolescence.

In contrast, External Environmental Obsolescence (EEO) refers to the external factors which occur outside of the organizational boundary and are beyond the control of the university. These factors can only influence the ERP obsolescence in an indirect way. EEO was found to take the form of policies and restrictions obsolescence, competition obsolescence and local IT market obsolescence. Therefore, the IEO factors differed from the external ones in this case in the following ways: 1) Different internal and external organizational environments; 2) Different regulatory procedures at the university compared to the external situation; and 3) Direct management control compared to indirect government influence.

After establishing these two key categories of internal and external environmental obsolescence, different types of obsolescence for each were sub-categorised, and the same process was then followed for each sub-category, and then each type of obsolescence caused by different type of issues were identified as sub-sub-categorises. Thus, associated factors that led to ERP obsolescence can be tracked by analysing the relationships between these different types of obsolescence. However, it should be borne in mind that this is not the final phase of grounded theory analysis, since this involves a comparison of the emergent theory to the existing literature (see Chapter 5)

As the above figure shows, the overall construction of the theory indicates the necessary structure of this chapter, which identified and described the various types of obsolescence affecting ERP obsolescence in the given context.

The next section will describe the separated categories in more detail. The discussion begins with the IEO (Section 4.2), before going on to describe the EEO (Section 4.3), and consists of four sub-sections, as follows:

- System Obsolescence (4.2.1);
- Organizational Obsolescence (4.2.2);
- Human Resource Obsolescence (4.2.3); and
- Management Obsolescence (4.2.4), in this order.

The following sub-section considers the nature of the EEO which influenced this ERP obsolescence (4.3), consisting of three sections, namely:

- Policies and Restrictions Obsolescence (4.3.1);
- Competition by Other HEs Obsolescence (4.3.2); and
- Local IT Market Obsolescence (4.3.3)

Moreover, the codes were generated based on quotes from interview transcripts and the concept maps will be explained, in both cases through the interpretation of the researcher. Finally, a summary of finding and conclusion will also be provided.

4.2 Internal Environmental Obsolescence (IEO)

The internal Environmental Obsolescence refers to a variety of obsolescence types inside the given university establishment, where neither the university rules, the system or people need to change, which contributed to ERP obsolescence (see Figure 4.2). According to the research findings of this study, the IEO can be categorised in the following sub-categories of obsolescence, namely, System Obsolescence (4.2.1); Organizational Obsolescence (4.2.2); Human Resource Obsolescence (4.2.3) and Management Obsolescence (4.2.4), which are discussed in more detail below.
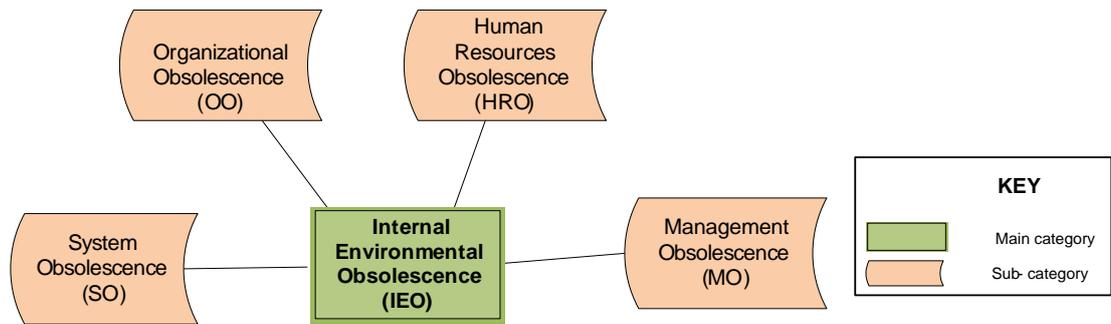
Figure 4.2: Concept map of one IEO category

4.2.1 System Obsolescence

System obsolescence refers to the system functionality becoming obsoleted due to the different types of obsolescence impacting on software maintenance and its infrastructure, which thus led to the previous ERP system obsolescence. Four sub-sub-categories (sub-obsolescence types) emerged for system obsolescence, listed below according to the categories of obsolescence:

- Logistical Obsolescence (4.2.1.1);
- Planned Obsolescence (4.2.1.2);
- Functional Obsolescence (4.2.1.3) ; and
- Postponement Obsolescence (4.2.1.4).

On the basis of the above type of system obsolescence identified, the following section will explain each sub-obsolescence and all its related issues individually (as shown in Figure 4.3)
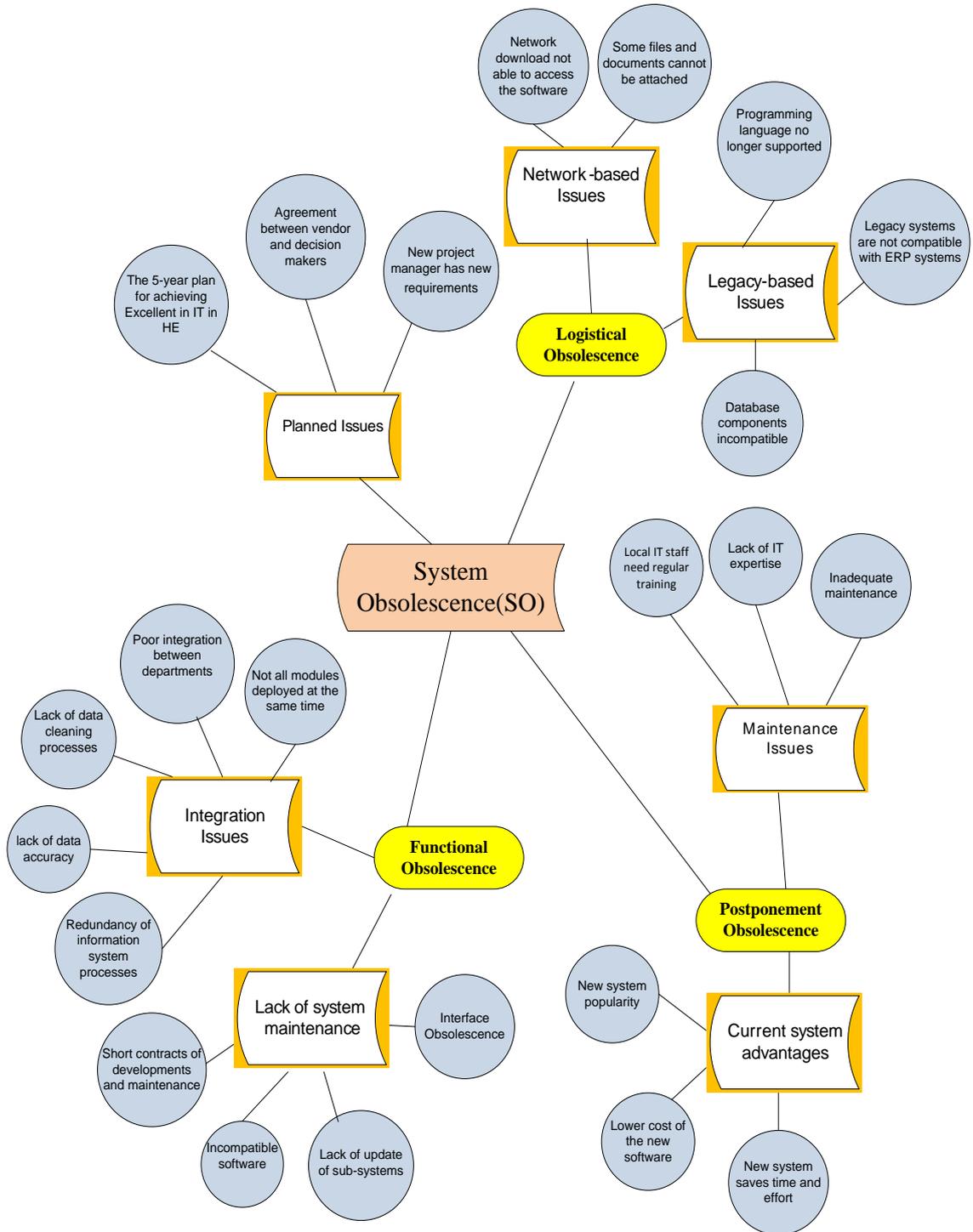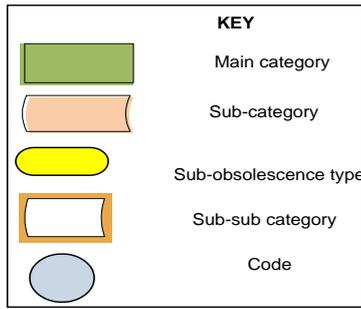
Figure 4.3: Concept map of system obsolescence

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The following section discusses each sub-obsolescence factor individually.

4.2.1.1 Logistical Obsolescence

It was identified in the data gathered that logistical obsolescence refers to the limitations of the previous ERP system infrastructure that impacts on the system accessibility and consequently resulted in termination of the system, making it obsolete. Therefore, logistical obsolescence is categorised into two different sub-categories: 1) Legacy-based issues and 2) Network-based issues, as shown in Figure (4.4).
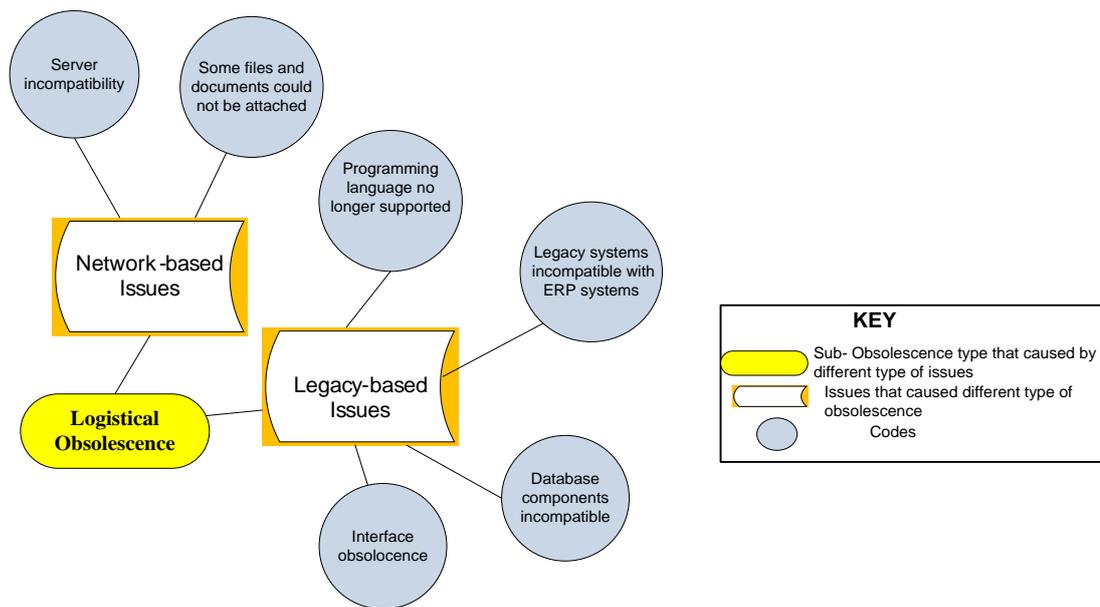
Figure 4.4: Concept map for Logistical Obsolescence

4.2.1.1.1 Legacy-based issues

As indicated by different interviewees, legacy-based issues refer to the old version of system requiring necessary parts, such as the same programming language, system compatibility and database compatibility to integrate and support the previous ERP system which became obsolete due to technology development. Related issues identified include the following: 1) Legacy systems were not compatible with previous ERP systems; 2) Database components and personnel skills incompatibility; and 3) Programming language no longer supported.

➢ *Legacy systems were not compatible with previous ERP system*

In the context under study, the previous ERP was incompatible with other IS applications that had been implemented and developed at the university, due to the way both legacy systems had been built, including the infrastructure and the change of

settings, as well as the nature of IS decision making at the university; all these elements that caused incompatibility were also in different timescales, as explained by decision makers at the university:

"Basically, we implemented different legacy systems that were functionally not found in the previous ERP systems; alongside this, the tools for integration between the ERP system and the legacy systems were also not available. As you know, the system structure and the way both systems were built were to a different timescale with different IT staff, and the decision-making processes for both were also different. Therefore, IT staff found it difficult to manage the automation required"(N2).

Moreover, the previous ERP was inconsistent with the ERP banner at the university. Each of these systems had been implemented by diverse vendors, which led to losing the main purpose of implementing the ERP, as expressed by another participant: *"To integrate information across the university to allow the automation of different activities, such as finance, human resources, the student management system… and chain management"(N11-IT manager).*

As identified by Director of Financial Management and Administration: *"The main purpose of the ERP is to automate our department but in fact this did not happen due to the inconsistency between to different types of ERP that had been implemented; and because the decision makers were different for each area at the university. This led to system fragmentation"(N10).*

As reflected in the above quotation, both of the above factors were considered to be crucial issues to the actual use of the ERP system because they prevented the departments from exchanging data and restricted the required integration across university departments. Subsequently, this led to inefficient information flows between different units at the university, which reduced system efficiency and delayed work procedure, as supported by the statement that *"Staff were not able to exchange the required information among faculties and units; they started to complain about task delay" (N13-M).*

Many of the interviewees mentioned that system incompatibility was caused by university policies and rules, a lack of communication, IT staff exclusion and the nature of IS decision making at the university, which affected the continuity of ERP, thus making it invalid, as supported by decision makers, thus: *"As a governmental*

university, we had to follow the new guidelines and rules, the regular change of policies needed a regular change of some functions of different IS systems at the university, which led to requests for many modifications, which made the compatibility even harder". (N1)

"*I did not have regular communication with other departments, as some of them were unwilling to share their opinions and the rest felt that there was no need to interact with each other as they had their own way of making decisions related to the ERP systems that served their own particular needs, but once it was decided to integrate the ERP system, we found real difficulties with such kinds of automation when the university decided to replace the current system with the full ERP package*" (N3-D).

All the above factors mentioned by the participants, including university policies and rules, a lack of communication, IT staff exclusion and the nature of IS decision making at the university, will be discussed in Sections 4.2.2 and 4.2.3.Therefore, as asserted by a number of interviewed professional IT staff, the nature of the decision-making process and the communication between different departments had a strong relationship, and "*isolated decision-making resulted in system incompatibilities.*" (N11-IT).

This confirms that the static model adopted in previous literature does not account for these aspects of the ERP process. As a result, this study attempts to explain and illustrate the dynamic interactions among factors.

➢ *Database component and personnel skills incompatibility*

Database component incompatibility is caused by the way a new database is created, and through poor planning of the building of a central database to automate all administrative departments, due to the difficulties of transferring data from the old to the new one. *"There were inconsistencies between the previous database structure and the existing database structure, which made it difficult to transfer the data; as a result, some data was missed" (N2-DM2).*

Personal skills incompatibility was also noted, thus: *"We did not have the right people who had the right system skills; we even found it hard to recruit those whose expertise matched with the previous system. I did 145 job interviews were none of them has the targeted skills*" (N1-DM1). The database required technical staff with competencies that matched its structure but the change of database made the previous staff who were available at that time incompatible with the new database. In other words, the available

IT staff abilities did not match the minimum requirements of database efficiency, which therefore led to the replacement of the database and a need for new IT specialists with knowledge of this kind of database as a specific part of the system. Therefore, the need to change the database led to ERP system obsolescence, as the new database needed to be compatible with the system and its other parts, such as staff skills. This shows how the lack of system vision and long-term planning can make the system obsolete and its components incompatible, thus leading to the replacement of the system that is still functional.

➤ *Programming language no longer supported*

The computer program in some systems was written in COBOL and at the time of writing few organizations used this language and there was a lack of technical support in this regard, which meant the software infrastructure made the system obsolete, as the tools/codes required to integrate the ERP software with other software applications were unavailable to re-programme the system, as stated by a decision maker *"We were working with the some systems that were written in Cobol language, in which some codes required specialized workstations in order to perform their operations; however, we knew that these features were no longer available as not many companies use it nowadays"* (N1).

➤ *Interface Obsolescence*

The interface of the previous ERP system was in the old setting of the COBOL language in which this interface's equipment is no longer supported on the local market, thus the ongoing maintenance was difficult to accomplish, as supported by the decision maker: *"There were complications to overcome the problems raised in the previous interface as the vendor does not support it in the local market anymore" (N2).*

Another cause stated by the decision maker was that the users were unsatisfied with the poor quality of the interface and its old style, which caused inflexibility and the inability of the system to obtain the data and information it required.

"The system was running with a poor user interface through the COBOL system, and the end users complained about the low level of flexibility caused by this out-of-shelf interface. As a result of this, the end users were not able to get the data and information they wanted from the system, which thus led to user dissatisfaction about their work achievements." (N1)

4.2.1.1.2 Network-based issues

Network-based issues refer to network infrastructure problems that prevent the system from sharing important files and accessing the ERP modules. It also refers to the new organisation requirements that required changes in the network infrastructure. This issue is caused by two sub-sub-sub-categories which emerged from the data analysis, as follows:

➢ *Some files and documents could not be attached*

It is important for an ERP system to provide a sufficient response time (RT), Response time (RT) refers to the timeframe required for a system to generate an output when an active user presents an input, and one of the critical requirements of an ERP system is that it facilitates an adequate RT. It is generally the case that RTs are impacted by two central factors: Network infrastructure and Computer infrastructure. Therefore, it is also important to highlight that these factors influence one another. Consequently, it is necessary to understand and determine the kind of infrastructure regarding the network and the computer. Computer infrastructure, which involves sizing tools (for example, CPU, memory, and disks, among others) is necessary in accordance with a certain active user level. Thus, the university and ERP retailers ought to ensure a sufficient RT at the level of the server, and this can be achieved by employing the relevant sizing tools. It should also be acknowledged that the standard of network formulation is another factor that has an impact on RT, but no universal sizing exists for the network; this relates to both the local area network (LAN) and the wide area network (WAN). Networks are resources that are powered by a number of factors, including traffic, errors, bandwidth, and protocols, among others, and they operate for the purpose of providing an ERP's suitable network infrastructure. Importantly, this necessitates the possession of comprehensive insight into the application architecture.

In the current study findings, a number of interviewed professional IT staff and managers from different departments claimed that ERP obsolescence was affected by *"The termination of the network, which impacted on the response time activities of the previous ERP system, as the network infrastructure was poorly designed"* (N9-M).

IT1 reinforced this point when stating that *"We were suffering from a massive usage load on the network across the entire university, as you know that each year we receive too many students, open new branches and departments, and the number of staff has*

increased dramatically. We do not have a strong IT infrastructure such as network facilities, which affects the core activities between departments and different organizational units and the overall ERP performance at the university" (N14-IT).

Another interviewee stated that *"The files cannot be attached by email, as 20% of the network of the entire university is internet and 80% intranet. The speed and the quality of the network are important in order to achieve the purpose of the use of ERP" (N12-IT).*

Understanding the network infrastructure that can impact on ERP system activities should be done well in advance to ensure optimal resource utilization, since any changes to the ERP system modules, including add-ons, need excellent network connections, and a high power and capacity server. The lack of understanding of this alignment for updating network infrastructure, computer infrastructure and servers contributed to the obsolescence of the previous ERP system. The university brought in new changes that did not match with the current network infrastructure, which led to a reduction in response time and impacted on ERP tasks. End-users became frustrated and complained about it. Therefore, the university required a change of network, and thus a change in computer infrastructure. Since the cost of these issues was higher than having a new system and would also take more time to implement, the decision maker decided to make their previous ERP system obsolete and move to a new vendor which could deal with these issues, as supported below:

An interviewee stated that *"There is a need for a high-quality internet connection. Most of the time the connection was terminated, so that we faced difficulties when submitting work activity and were unable to access some applications at the university. The users complained that they did not receive the task at the right time; therefore, the university wanted to improve the internet service by changing the network infrastructure, thus changing the computer infrastructure. But these changes cost more than having a new ERP system, so the decision maker decided to make the previous ERP system obsolete and move to a new vendor that could deal with these issues"(N11, IT).*

Another interviewee said, *"We are a governmental institution in which the use of the internet and the network are limited. We don't have even full or part authority to choose or decide to improve the IT infrastructure; we are just following the restrictions given by the business owner (decision maker), as we are not involved in any kind of decision making associated with the replacement"* (N14, IT).

As can be seen from the above quotations, the network infrastructure was not an IT decision but a business owner decision, related to the governmental rules in terms of using the internet. This shows the complicity of the situation in which understanding each part involved in the IT infrastructure decision is critical to ERP obsolescence, since usually the ERP infrastructure was undertaken by IT staff who knew more about the system. Therefore, IT exclusion contributed negatively on the choice of network infrastructure, which could have saved the previous system from obsolescence. This also shows the relationship between management style and system obsolescence, as well as governmental rules. Therefore, management and governmental staff responsible for or involved in making such decisions, should update their knowledge and skills about the IS/ERP requirements that need a proper network infrastructure.

➤ *Server incompatibility*

As explained before, the network infrastructure delayed the previous ERP system response time, and this also occurred in relation to the server architecture. The data gathered shows that the response time not only relied on the amount of bandwidth available but also on the suitability of the transmission carrier through the server. Since server sizing plays a vital role in ERP performance and usage, the university's previous server became obsolete. This obsolescence of the existing computer server was caused by two main factors. The first was a new university requirement for higher server power and capacity, which would have enabled access to the applications by all departments, thus improving the university business process and the performance of the ERP.

"*As you know server sizing is an important part of ERP performance and usage. When the university changed its requirements, the need for higher server power and capacity became more important. As the market regularly changes and a new server became available, the university decided to make the old server undesirable*" (N13-IT).

The second issue was the lack of compatible of servers in the market with the deployed ones and a mismatch with the previous ERP system, which thus led to ERP obsolescence. The reason for the unavailability of compatible servers may have been due to technology development.

"*There were no available compatible servers on the market, as investigated by IT management. This incompatibility resulted in the new server having a different design which was not compatible with the university computer infrastructure and with the*

deployed server, therefore, the decision maker asked for a new system that could provide a new IT infrastructure" (N3-D).

It is obvious from the above section and the provided quotations that the lack of awareness of ERP system requirements, including IT infrastructure (network, computer and server) and short-term plans, contributed to ERP obsolescence. This not only needs efficient network set-up but requires a deep understanding of the alignment between different ERP system components, the need for a flexible network architecture, as well as network management. More importantly the management of the network after its implementation is considered to be another factor that contributed to ERP obsolescence, as the managers did not update their skills for the selection of a network infrastructure for the ERP system. All of these various aspects played a role in each individual component of the system, and impacted on each other aspect. Thus, it is important to remember that, if the university continues to replace the system with the same poor infrastructure, the outcome of ERP replacement in the future will be the same.

4.2.1.2 Planned Obsolescence issues

This section discusses planned obsolescence issues, which emerged as one of the internal sub-categories, and refers to built-in obsolesce, which made the previous ERP obsolete over a certain period of time, when the ERP decision makers and project leader had new requirements and a short-term strategy based on their period of the tenure. It also relates to the agreement between vendor and decision maker to introduce obsolescence into the previous ERP system, with the objective of designing the system for a limited period and then pushing the university to replace it within a short period of time. This sub-factor includes three sub-sub-categories, namely 1) Requirements of project manager; 2) Agreement between vendor and decision makers, and 3) The 5-year plan for achieving Excellence in IT, as shown in Figure 4.5.
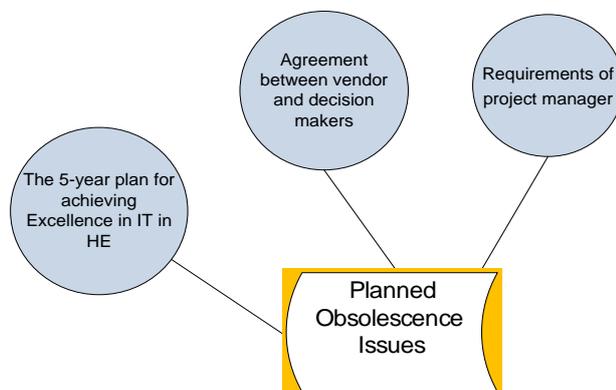
> ➤ *Requirements of project manager*

Project managers in different areas and departments were given the freedom to decide which ERP system to adopt, depending on the needs of their departments, as stated by the decision maker:

"The decision across the university is a business owner decision, which means each administrative unit makes its own decision. It is not 100 percent an individual or collective decision; it is all based on the decision makers in each unit in the organisation who, during the commissioning period, are authorised to decide on the restrictions or new requirements involved in applying or developing the information system in their area." (N2)

A related reason for planned obsolescence can be a change of management. A new manager is likely to have different priorities than the previous one. *"For instance, DA in his first day in his new position as Head of the IT Department and decision maker was asked to develop a local ERP system to improve the core activities among different departments." (N14-IT)*

As this interviewee notes, due to the fact that most senior members of departments tended to be on short-term contracts, it was therefore more beneficial for them to implement a system in their department which would satisfy the department for the period of their own tenure and then be obsolete afterwards. Moreover, the IT staff explained that such departmental leaders build their reputations on the basis of the success of their implementation strategy in their particular department, with no other member of staff recognised for the part they played in the process:

"All we know is that the university keeps changing their managers and renewing the contract from time to time. Most want to leave their own fingerprints on the project to either the university's benefit or their own advantage. This is the truth. As a member of the IT staff I do not have the authority to even provide or engage in the IS decision. It was right that we gained a high reputation and many awards for the previous ERP system but only the head of the IT Department received accolades for this." (N17, IT)

Moreover, this process seems to be endorsed by the government, who are keen for the countries' leading universities to be seen to be competing effectively on the

international stage: *"And you know how the government value these improvements for both the university and the project managers in the region in terms of the future vision".* (N13-M)

As well as individual managers being influenced by the desire to maximise their reputation over a relatively short time of period, universities are driven by similar requirements, namely the need to outperform rival organizations:

"In the previous ERP, we received many orders and much encouragement from inside and outside the university. Through the previous ERP, we reinforced our position as a leading university and won a high reputation in IT development. The previous ERP decision maker obtained and received many recommendations... And after changing the Dean of IT, the new dean asked for the SAP ERP system to be implemented, as he said we needed the best IT practice to maintain a leading position." (N9, M)

As perceived from the decision maker of the previous system, the system was built to be obsolete after a relatively short period of time, *"as any industrial design company, designing their artefact or product with artificially limited useful life"* (N1-DM1). For instance, many organizations attempt to build or develop their own ERP system with certain specifications and plan that the system will become obsolete after a certain period of time. Mostly, the rationale behind this strategy *"Is to generate short-term plan by enhancing the university name in a competitive market, giving the project managers an outstanding reputation in the market and letting our partners catch on the system and then move to another system or product (Commercial package for business) platform" (N4-M).*

Obsolescence involving the neglect of possible outcomes of short-term behaviour were also mentioned by another interviewee, including "insufficient *support from the project manager which led to unwise decisions, such ERP replacement" (N13-IT).*

Furthermore, there was a need to recognise that the university is not like other business organizations, whose profit level builds their reputation to gain more students and staff; as well as the system being used to succeed in their daily work. However, developing their system with a short-term focus brought another type of strategy used to generate profit and gain a competitive advantage in terms of the local business benefits.

In addition, DM1 stated, *"The University exposed the system and its services to their partner and any public institution in their area. Well, by considering this University as*

leading university in the region and the first IT house expert department, as published in 2004, many organizations followed us and purchased our system... For instance, the Ministry of Health asked the university to sell it their system, as you know the rules and policies for most governmental institution are somehow the same." (N1)

➢ *Agreement between IT staff and decision makers*

Another subcategory which emerged from the analysis is referred to as built-in obsolescence, which involves negotiation between the vendor and the decision makers for the system to become obsolete after a limited period of use.

"We planned to start implementing the system with our local vendor, but we were worried whether the system would achieve the minimum requirements, so we shifted to a short-term plan (2 years) and designed the system for the current requirements, as happens even in the western countries, which have a similar replacement lifecycle. At the time of deploying the system we succeeded in automating the essential activities at the university." (N1-DM1)

As discussed in the above sub-category (see Requirements of project manager*)*, this method or strategy is related to the period of tenure of decision makers.

"We know the objectives became obsolete after sometime and will change; therefore, we worked within the current available resources as the available resource cannot handle all ERP modules. As a result, we started with the few ERP modules. By this time the technology market had improved, making the objective obsolete in which the existing budget and vendor market can handle all the issues." (N3-D)

➢ *The 5-year plan for achieving Excellence in IT in HE*

As mentioned in section in LR (2.4), the Ministry of Higher Education in Saudi Arabia is running a five-year plan involving many different criteria in teaching and implementing IT and the overall developing of the universities across the country.

New rules and requirements have forced the university to adopt specific practices: "*The ministry of higher education's vision is changed regularly, which includes the ways of teaching and use of technology. I do not know if you have heard about e-government, in which all public institutions have been required to simplify and ease the governmental processes. At this time the head of the university was asked to create a smart university and look internationally at how universities look in developing countries, so we reached*

the point of using the latest technology, such as SAP, as the best plan for the future"
(N2, DM2)

From this quotation, it is evident that the 5-year governmental plan encouraged the university to generate a short-term plan, thus motivating managers to seek a limited project plan instead of a long-term plan.

4.2.1.3 Functional Obsolescence

In addition to the above sub-categories, functional obsolescence is another internal sub-category that emerged from the practise of the analysis, which refers to the reduction in system functionality that has led to the obsolescence of the previous ERP system, due to its outdated design features that cannot be easily changed, and the inability to maintain the system to serve the university and its new needs. As shown in the figure below, this sub-category is divided in two sub-subcategories: 1) integration issues, and 2) lack of system maintenance. Each of these sub-categories has its sub-sub-categories, as illustrated in Figure 4.6.
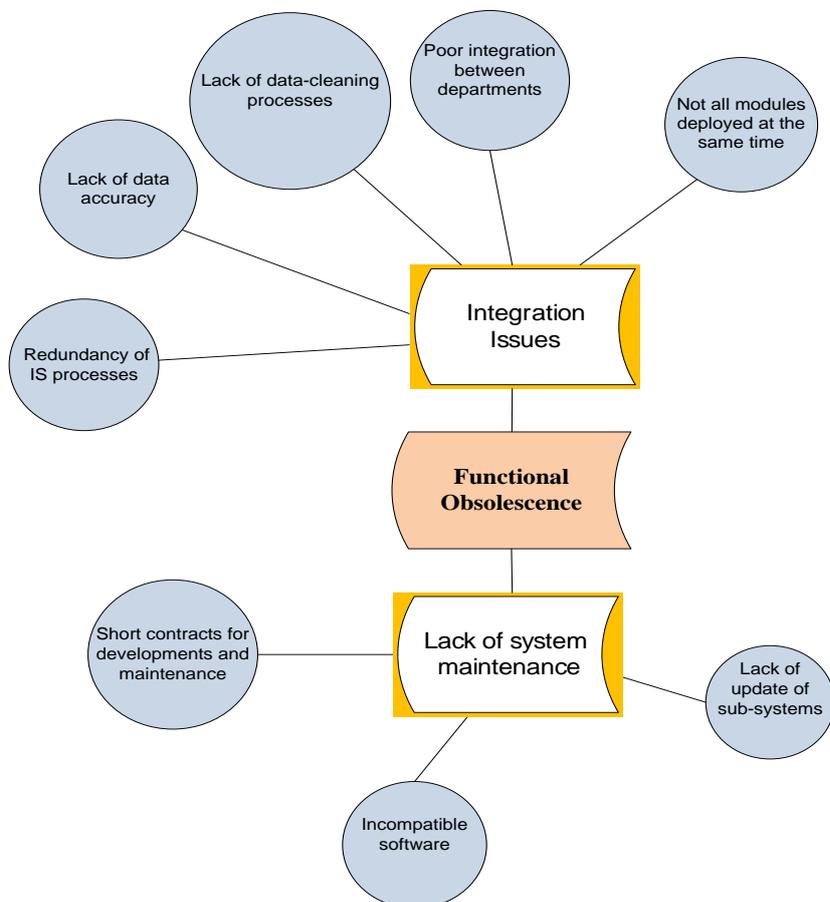
Figure 4.6: Concept map of Functional Obsolescence

4.2.1.3.1   Integration Issues

This section deliberates on a set of issues that emerged from the data analysis, as illustrated in the above figure, which belongs to integration concerns, as follows:

➢ *Not all modules deployed at the same time*

Typically, ERP as a software package consists of multiple software modules that are either developed or purchased individually, based on the specific requirements, goals and technical capabilities of the organization, as mentioned in Chapter (LR). Despite this, many previous ERP studies has mentioned and supported the fact that applying a single ERP module in the first place is better than applying all the modules at once. The current study considered this strategy to be a risky decision and a critical obstacle for the continuing use of the ERP system, which led to complications regarding the integration of the entire activities across the university. This was stated by IT manager "*We thought is more meaningful to apply one by one module instead of applying the whole modules at one, as the tools and equipment's were not available to apply the full package at the same time*" (N13).

An IT programmer said this was caused by the time gap between deploying each diverse module, during which the requirements were changed for functional reasons and new policies imposed by the government:

"We are in trouble; we did not realise the late development and deployment of the ERP modules would affect the university that much, due to the passage of time; and the fact that, as a governmental institution, the expectation of the issuing new rules and policies is high. The regular changes of information system rules and government restrictions required new modifications to match and fit these policies. Therefore, the university faced a problematic and difficulties in the integration" (N14). This is related to a change of management, as mentioned in Section 4.2.4, in that the new manager has new requirements that lead to changes of information system requirements, such as specific sub-modules and new modifications, as result of the new functions added, thus affecting system automation.

Another interviewee associated the delay in deploying the ERP modules with other causes, such as a lack of professional IT staff:

"We had only a few people who worked in the system, so the development period went slowly; as I said we did not have enough people to handle it." (N17)

Furthermore, the decision makers in different departments had different priorities due to specific needs; and the different time frames of decision makers in various departments meant less compatibility overall.

"We had different vendors for the use of information system at the university, which is related to the different decision makers' needs and their decision-making style in choosing the IS applications." (N4-M)

➤ *Poor integration between departments*

As mentioned before, the system modules were deployed separately and by diverse ERP vendors, this fragmentation led to poor integration between departments.

"Our legacy automated system did reach the high level of integration; there are still some other barriers that impacted on the required integration. In fact, we know that the system was not applied at once; the system components developed individually which obviously impacted on the automation that desired." (N2-DM2)

Another cause of fragmentation, as mentioned earlier in Section 4.2.1.1, was that personal incompatibility and the mismatch between people skills had a crucial impact on the integration of the system, as well as the lack of communication between decision makers, which is vital to the quality of integration.

➤ *Lack of data cleansing processes*

The cleansing of data refers to the process of cleaning up or scrubbing data in the database that is incorrect, incomplete or duplicated. Technically, data migration and the cleaning process is considered to be critical for the ERP transition phase, so the university and vendors need to pay more attention to avoiding problematic issues that might be encountered during this phase, since inconsistencies, inaccurate and missing data can occur and thus directly impact on integration and data workflow and reinforce the need to replace the ERP system, as supported by a decision maker:

"The data cleansing process is considered to be one of the activities that the university has not applied effectively; the codes of some independent modules were not organised well. As a result, there were many misidentifications and the collection of data from various sources was often missed." (N1)

➢ *Redundancy of information system processes*

The duplicated data occurred in the use of the previous ERP due to the use of different ERP system, which led to low data accuracy, affecting the entire process as a result and reduced the data-search speed, as well as decreasing data storage space.

"As another obstacle that we found in the previous ERP, the duplication of the data entry affected the quality of our all activities." (N8-SD)

➢ *Lack of data accuracy*

Additionally, according to the statement provided by some informants, the inaccurate data had a very negative impact on the previous ERP integration and its performance. Considering ERP as software package that had a central database which required high data accuracy in order to accomplish the effective and efficient integration, meant the entered data being stored and spaced in the central database, and becoming available directly to the whole organisation. Therefore, any incorrect data put into the system would immediately influence and create problems for the integrated system, due to the negligence of the user and a lack of attention when entering the data due to the shortage of the training period, the quality of training and the limitations of number people involved in the training phase. As a result of this poor quality data and integration arose.

"In the previous ERP, the invalid data was not automatically detected and prevented while getting to the process: for instance; incorrect item numbers, transaction orders and date arose. These referred to deficient system design and significant data errors by careless staff, less focus when entering the data, as well as insufficient training." (N6-M)

4.2.1.3.2 Lack of maintenance

In addition to the above sub-category, this section reflects a set of issues and underlying issues that emerged from the data analysis, as illustrated in Figure (4.6), which refers to maintenance concerns, as follows:

➢ *Lack of sub-system update*

As is well-known, it is important to maintain an up-to-date ERP system to improve the university's performance overall. However, organisations such the university under

study faced many issues related to developing and updating their individual ERP modules. These refer to the high cost of further enhancements, including the need to install add-ons; the university was not willing to spend a large amount on system maintenance, as the following statements suggest:

"In my opinion, the university does not need to rely on or spend a lot of money on a system that needs a significant budget, in order to cover all issues associated with maintenance matters; obviously, instead of spending the current budget on regular maintenance issues… it is much better and preferable to spend the current budget on a new system that can solve the maintenance issues and meet the new organization's needs." (N1-DM1)

Another issue involved the problem of foreign staff not being present during their holiday spells, which meant that there was insufficient IT staff available for ongoing maintenance, as stated below:

"*We had a few people who were foreigners which meant they went on holiday very often." (N9, M)*

Another participant emphasised that "*We cannot depend on those people any more to fix and support the necessary requirements (N7-M).*

➢ *Short contracts for development and maintenance*

It is perceived that IT contractual issues were negatively affected by the signing of short-term contracts. These fixed-term contracts were influenced by governmental policies, as most IT staff were foreigners, since some regulations were implemented, regarding the renewal of visas and the duration of vacations. Thus, work was delayed as unsolved problems could not be undertaken by local IT Saudi staff due to their lack of expertise and a lack of trust in their work quality.

"*Even if they are willing to renew the IT staff's contracts, government policies imposed on them have many requirements, such visa expiration issues, which leave these IT staff members worried and frustrated in their work, and sometimes they threatened to leave." (N7-M)*

The main consequence of the policy decision to employ many foreigners in an IT role was that there were periods in which there were insufficient numbers of staff remaining to maintain the system.

"As foreigners, they need their right to go on holiday but we worry if they leave work either for a holiday or because they quit the job, the system functionality would be delayed and problems which cannot be resolved by local IT Saudi staff occur. Technical skills and the structure of the university were better known by the foreign staff than by Saudi ones." (N1-DM1)

➢ *Incompatible software*

As mentioned in the above section, a lack of updating led to outdated data, the low data accuracy then impacting on the performance of the system and the efficiency of the business operation. However, it is worth mentioning that updating and upgrading issues, including further improvements of the system and its subsystems, are a significant part of the ERP lifecycle. Therefore, *"Updating and upgrading one part of the system rather than the others led to the unrequired incompatibility between two versions of the software" (N13-IT).*

The same point was supported by the HR manager:

"Unfortunately, this type of strategy [updating] did not work well, but the university did not have any other options. There were a few IT staff who dealt with the system which made the updating as a whole impossible." (N9)

4.2.1.4 Postponement Obsolescence

This section focuses on the sub-category of Postponement Obsolescence in which the update and upgrade of the previous ERP was not introduced. This sub-category is formed by two sub-sub-categories, as shown in Figure 4.7.
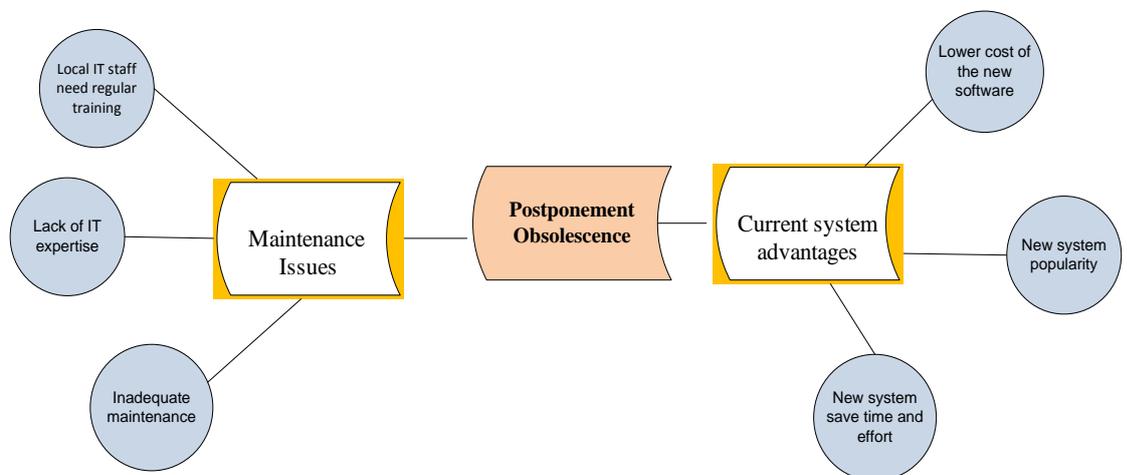
Figure 4.7: Concept map of Postponement Obsolescence

4.2.1.4.1 Maintenance Issues

Maintenance Issues refers to issues that prevent updating and upgrading of the previous ERP system. These issues divide into three sub-categories, as follows: 1) Inadequate maintenance; 2) Lack of IT expertise; and 3) Local IT staff need more regular training.

➢ *Inadequate maintenance*

As mentioned in Section (4.2.1.1), the technical errors that existed in the previous ERP could not be speedily overcome. "*We are a leading university; if the system operations are delayed and cannot be solved very quickly, we will see our names in the social media everywhere, the staff and other stakeholder will mention and post this action and this will affect negatively our position in the universities market, including the university staff, student and suppliers and the new student and employee, you know, buying reputation is not like buying any ordinary thing" (N1-DM1).*

➢ *Lack of IT expertise*

"*Despite that we are considered to be a large university that has different faculties and units but we did not have adequate IT staff to undertake the system maintenance and review. So, I can say that it was more beneficial for us to replace the system, as the lack of IT resources impacted on the continuity of the previous ERP system." (N1-DM1)*

The above declaration clearly specified that a lack of IT experts was a substantial obstacle that prohibited ERP users from conducting regular system maintenance, including updating and upgrading the system; therefore the university decided to make their system obsolete.

Further analysis of the interview data indicates two fundamental reasons for the ERP replacement decision. On the one hand, M5 directed that the university, represented by decision makers, preferred to employ a few non-national IT members of staff for the short-term rather than invest in existing local employees for long-term success. This shortage of employees meant the university was unable to conduct a system review and the required extensive maintenance.

"*This absence of IT staff was due to strategy that the university used; more specifically, the decision makers asked a few foreigners staff to check and ensure system maintenance." (N10-D)*

On the other hand, IT4 stated that the overwork experienced by these foreign employees made them irritated and in some cases to be no longer willing to work at the university. As a result of over-dependency on these experts, the knowledge gap between the local staff and the system, for which the replacement of previous ERP was the solution, inevitably exacerbated this issue, rather than solving it.

"The foreign workforce felt they were overloaded with duties that frustrated them and encouraged them to leave their positions and find another job. In this sense, the university stock with their system as the local available staff did not have the required knowledge, therefore the decision makers decided to change the system." (N14-IT)

> *Local IT staff need regular training*

One of the issues that appeared in the current research context was the lack of training and monitoring for the previous ERP staff. Not all staff were involved in the training courses as the university mostly relied on foreign ERP professionals, therefore, they were not able to maintain the system.

"Despite the expectation for each of our internal ERP core staff should attend regular training, in fact there were an obvious lack of motivation from both top managers and project leaders to train local employees. This absence of engorgement and motivation reinforced the standard level of employee who have lower skills and abilities than the overseas experts who already have the expertise; thus, local staff were unable to deal with any maintenance activities." (N5-M)

The IT manager stated that *"The ERP supervision team did not review staff training on a regular basis; thus, staff found difficulties with introducing further system maintenance." (N13)*

"Some of the previous staff were not checked for performance on a regular basis. Moreover, the training was mainly for non-local staff. Sometime, managers just felt that it was risky to train local staff as there is always competition in Saudi market for those who have such ERP skills…, Therefore, top managers worried that, if we gained ERP abilities, we would just go to a competitor. This is why the university depends on a few foreign staff to tackle ERP issues, such training and maintenance… and the number of local staff is too many. Due to these challenges, the university decided to have a new ERP vendor to take care of all the maintenance matters." (N6-M)

From the above quotations, it is clear that the reliance on non-local staff in most core activities led mangers to ignore the monitoring and reviewing of local ERP staff training, which thus impacted on the performance of system maintenance.

4.2.1.4.2   *Current system advantages*

All factors influenced the ERP obsolescence that belong to the current ERP advantages at the university, including system popularity, the lower cost of the system and saving in system management and development time, as illustrated in Figure 4.7.

➢ *Lower cost of new software*

The lower cost of the current ERP system was another sub-category that emerged from the data which contributed toward the ERP replacement decision. Since the university was required to achieve the lowest cost consistent with its competitive strategy, The decision makers decided that the lowest cost would be achieved by having the SAP ERP that would bring outsourced, qualified IT staff and managers for less than competitors' would have to pay, and could save enough funds for training and maintenance.

"*Basically, the university, as any other organization, seeks to use the system to achieved higher productivity and meet university needs for low cost projects.*" *(N2-DM2)*

"*The SAP ERP system takes less effort, as in the market place differentiation and competitive advantage play a significant role in terms of a lower cost system provision and effort compared to in-house management.*" *(N1-DM1)*

Another employee reinforced this idea that reducing the costs of development and maintenance was a prominent driver, making the fixed costs into variable costs, to achieve better cost control that would improve the cash flow. The alternative important driver for ERP replacement was to apply a reduction in the cost of workforce, materials and parts, which occurred due to in-house training and employment costs being higher than the expected costs for the ERP function.

"*The current SAP ERP cost compared to the cost of previous ERP maintenances and developments, for instance by bringing SAP ERP and SAP staff in would help the university to move from the fixed cost into variable costs, such as payroll or staff productivity and resources. Budgets for operating* materials *and investments of infrastructure can be reduced step-by-step after the services are outsourced by current ERP (SAP ERP) for both system and staff and cash flow improved.*" *(N6-M)*

The inventory manager confirmed the above statement by giving a more detailed response: "*All tools, equipment, vehicles and facilities used in the current operation have value if they improve cash infusion by being transferred to the SAP contractors, making capital funds more available for core activities and reducing the need to invest capital funds in non-core functions, and making them available for core areas, in which the university considered the replacement of the system and having new external conductors to increase flexibility in finance and university budget, and to make capital funds more available for core activities.*"(N7)

The decision maker added that the SAP would "*improve cash flow*" (N2), since the cash flow of the university under investigation would improve when it had fewer workers, as it required less support systems as well as infrastructure.

The IT director stated that, by saving on labour costs and by using new technology for efficiency instead of investing the current available cost in internal in-house staff and systems, the costs could be reduced.

"*Gaining competitive advantage is not only about having new technology but also requires a good planning strategy to save the staff and training costs with this new technology, to save enough money for necessary issues for the continuance of the system.*" (N3)

The decision maker also indicated that "*the best benefits of replacing the previous ERP were in decreasing in the labour and system maintenance costs, and the operating costs, and gaining a competitive advantage. The reduction of these cost was based on our contractor's experience in providing certain facilities more professionally and effectively, such as SAP ERP, with its reputation around the world.*" (N2)

This response confirms the previous statement and leads in to the discussion in the following section about SAP ERP and its reputation, and its staff and conductors' extensive experience around the world.

➢ Current system popularity

A number of interviewees indicated that the reputation of the system would give the university the ability to compete with its partners, as supported by the decision maker

"We look at the most prestigious available system that can build up the university's reputation in front of its partners" (N2).

Anther interviewees stated that it was thought that having the ERP SAP would bring newly qualified staff with exclusive skills related to this particular international system, and thus the university's reputation would rise, as mentioned by the IT director:

"Building an international system with a high reputation such SAP ERP meant that we would gain a new staff that had the ability to operate the new system, therefore I think the replacement of the previous ERP reflected positively the university's reputation." (N3)

By then the previous system had decreased in popularity and thus lost its economic benefits, as partners stopped purchasing the university system.

"We know that the previous ERP could not return any benefits any longer as an investment in the system and its technical staff for our partners and other organizations as the system popularity dropped and needed to be taken off the market." (N10-D)

The decision maker also stated that, *"I was quite worried about the risk of the previous ERP becoming less competitive and becoming less valuable and popular as before"* (N1).

➢ *Current system saving time and effort*

"Reducing the time needed to complete a job is an important objective for all organizations, as this creates the opportunity to follow IS improvements, which was not the case at the university as the maintenance required to develop the system integration and other updating needed more staff, as there were a few staff who worked with the system and the internal staff did not have enough knowledge to maintain the system. Therefore, the university had the option of a new system delivered by international conductors and its outsourced IT staff who could focus on the core activities of the system faster than the in-house one because they had the necessary tools and means." (N1-DM1)

It is obvious from the above quotations that a lack in-house staff can increase response times and can render the services at greater risk at times of high demand, such as when facing crisis events. Consequently, the university decided to have a ready system such

an SAP ERP with qualified ready IT staff to speed up the response to the overall systems issues.

The decision maker stated that there was a need to replace the previous ERP system as the workload could not be handled by the existing staff pool in order to reduce management load, which meant reducing control time and reducing the workload by freeing management to focus on the core activities. Subsequently, from the management's and decision maker's perspective, the previous ERP created work overload, while SAP ERP would not, as stated by the decision maker:

"The previous ERP was a huge system that required heavy and further maintenance. We decided to find out whether the system that could take over these issues by having ERP SAP, as it would be their responsibility to upgrade, plan, analyse and deal with other system issues. Our staff could not stand alone and carry out all this maintenance work due to lack of expertise and other foreigner staff leaving the job. So, SAP ERP was expected to decrease time required for the control and management of the core functions of the system." (N2)

Consequently, from the above quotation it can be perceived that the SAP ERP was expected to provide a ready package taking over all the maintenance issues, as they already had the skilled staff for this purpose, instead of spending time preparing and training staff from scratch in order to reach the necessary standard.

4.2.2   Organizational obsolescence

Organisational obsolescence refers to the obsolescence of organisation objectives, rules and political conditions that are not updated to match the system requirements, leading to a change at the university rules and policies, and the new organisation requirements being inconsistent with the previous system's condition, which contributed in the previous ERP system obsolescence. As the data indicates, the absence of the formal intra-organisational rules, such as reporting and documentation rules, often led to ERP obsolescence due to lack of updated methods to match the system requirements. Incompatibility with other organisational components occurred, such as employees, systems and tools/equipment used at the university. The final theoretical construct for this category is shown in Figure 4.8.
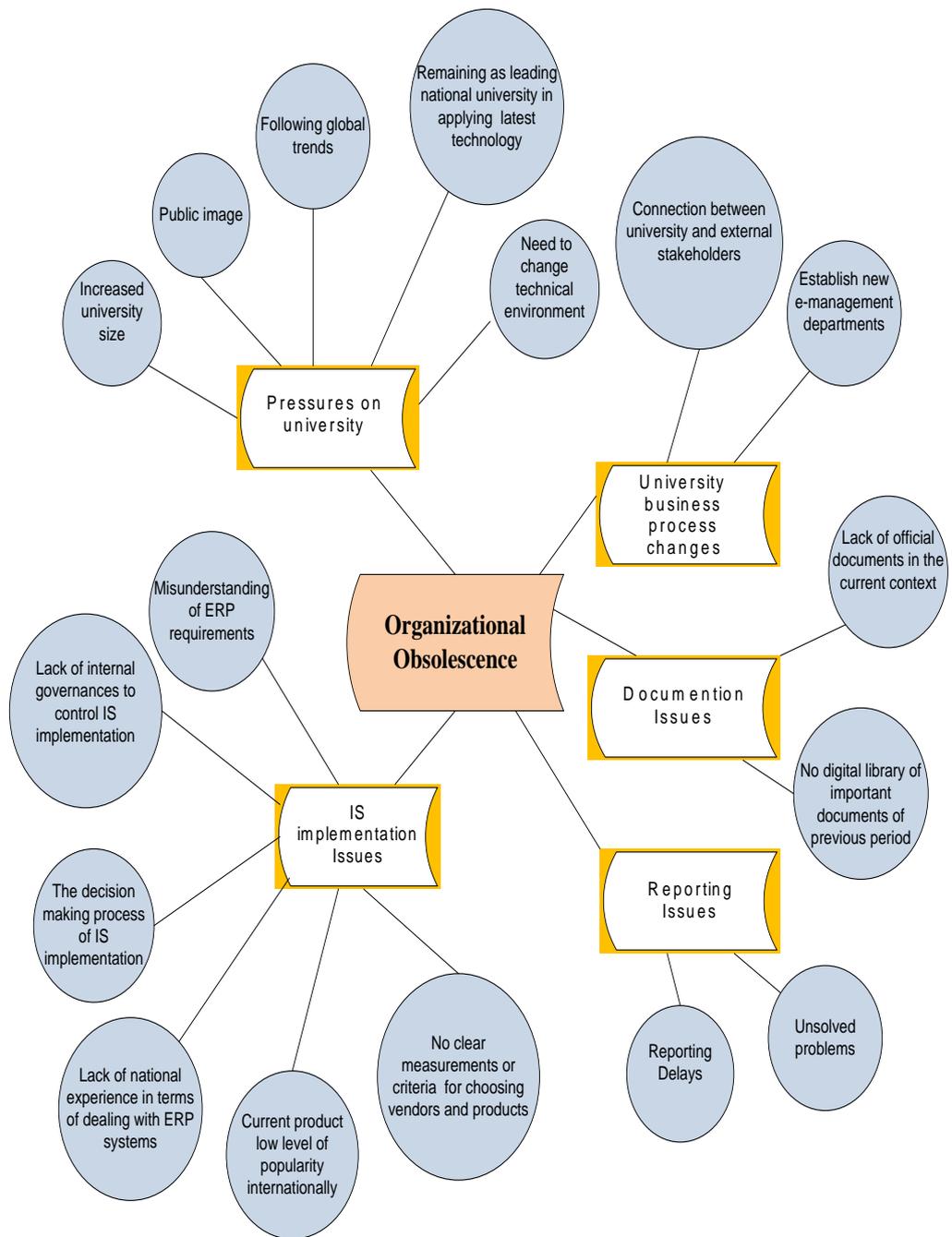
Figure 4.8: Concept map of Organisational Obsolescence

The following sections explain each sub-category shown in Figure (4.8) above in more detail.

4.2.2.1 Pressures on university

The university faced a wide range of powerful forces, internally and externally. This section presents the internal forces which contributed to ERP obsolescence. These forces divide into five sub-categories, as follows:

- Need to change technical environments;

- Remaining as leading national university by applying the latest technology;

- Following global trends;

- Public image; and

- Increased university size, as shown in Figure 5.6

➢ *Need to change technical environments*

Due to the out-of-date skills of available staff, involving both managers and the IT department, there was significant pressure on the university to upgrade and update their resources by recruiting new specialised personnel. However, the existing local market in this field did not match the legacy ERP system and database, as these overqualified individuals were unwilling to work with this legacy system, as pointed out by the decision maker:

"The university had a set of new objectives, one of which was to improve the existing technical environment by upgrading staff skills as much as possible to become a paperless university. Unfortunately, we had staff who did not know how to deal with computers. Therefore, the university… decided to hire new IT experts and managers who could train the existing staff, but the current market provided more qualified people who were unwilling to work with the required system skills, as they were incompatible with their own skills and our target." (N1)

As stated in Section (4.2.1), the database, people, network and the system, as the overall IT infrastructure, needed to be restructured, due to the emergent need of the new manager in this area. But the new market did not satisfy the university's needs. This pressure impacted on the system's performance; therefore, the obsolescence of the legacy ERP was implemented.

➢ *Retaining lead national HE role by applying latest technology*

The university has been in the leading position for many years and has been granted many IT awards from different governmental exhibitions. Moreover, various ministries in the region asked for their advice regarding the legacy ERP system at the university, as the system matched their requirements.

This was supported by the financial manager *"The fact is that our university has always been associated with excellence. Many public bodies, such as the Ministry of Health*

and Ministry of Finance, ask about our system, as we built it to match the governmental rules and policies, which did not need too much customization to implement. Furthermore, the university received many awards for its information technology system" (N4-M).

An increase in the numbers of universities in the region that started to apply an ERP system put pressure on the university under investigation to rethink how to retain their role as national leader, as before. Implementing the SAP ERP system as an international system was intended to reinforce their primary position, internally and globally.

"Many universities in Saudi began to apply a local ERP which was not famous. So, in order to remain the leading university, we needed to apply the newly available international technology, SAP." (N6-M)

It is obvious from the discussion above that the university not only sought to use the latest IT technology but was also concerned about their unique position and gaining and maintaining competitive advantage, and thus replacing the legacy ERP was seen as the solution to competition with their partners. Therefore, understanding the relationship between the internal and external factors is important.

➤ *Following global trends*

The university tended to follow the global trend of looking for uniqueness, as stated by the decision maker:

"We seek to follow the trend in the first place as well as to gain more advantages. For instance, we would have a high-quality system vendor and employ SAP ERP professionals, as this is the trend in the top western universities." (N1-DM1)

Another viewpoint, put forward by the IT manager was as follows: "*You know the trend is SAP, as many western companies have applied it. In order to be in the market place for high ranking university status we needed to follow the trend. We reached the point where we needed a strong system, as solid as SAP. For example, you see the trend in fashion for Dior and Chanel. For sure, as a woman, if you have two job choices, you will go for the one that will bring Chanel for you, without looking at its implications in the future, as your target is to follow the trend and to be fashionable, to look good in front of your community, as you live in the society that value these things. It is the same for ERP. Unfortunately, we live in an environment that values you for having the*

expensive item to show how you are ahead of others. The same applied at the university's case." (N13-M)

According to these data, it can be seen that the pressure trend, combined with the continued growth of software, such as SAP ERP, meant that companies such as Saudi University were unable to meet future growth as the legacy system's capabilities were limited compared to the top trending system. The decision to adopt this system was made without considering the compatibilities between the SAP system culture and the Saudi system culture, which was likely to prevent the success of the current ERP system, and thus require a further replacement process.

"Once you buy a dress just because it was from the west… it follows British culture but does not suit our Saudi culture. Many modifications [to SAP] needed to be made in order to be ready for use in our community but this heavy modification led to misuse and did not look as good as before… The university tried to be modern by using SAP but I think simply following the trend was a second failure." (N14-IT)

➢ *Public image*

At the university, people were unwilling to disclose issues and failures faced by the system, being extremely concerned about their image in the public media. In Saudi society reputation is your merit, and the most important measure and value of social worth. The university suffered from system issues as a result of this unwillingness to be open about the problems they were facing. For instance, HR modules had many technical problems which led to the loss of some of its data. The users started to complain as their salaries were delayed, and they expressed this unhappiness through social media.

"The system issues staff salaries which I can't allow to be late, even by half an hour, and if this salary isn't issued on the next day we will see our name and the university's in the newspaper saying the staff haven't been paid. And even more, to protect our image, we did not ask our partner to find solutions and they used it against us. You know our culture and how they think in term of mistakes, finding any weakness is more interesting for them, as it allows them to use it to undermine our image." (N1-DM1)

The university considered this to be more serious than any other system issue, as they knew how much it would cost them if they lost their reputation and image. Therefore, it

was unwilling to release the internal problems and failures to an external audience, such as other departments at the university and its business partner.

From another perspective, many employees stated that the university cared about its appearance among global universities, so the management decided to promote its uniqueness in terms of using the technology and other resources such as professional managers, users and staff, compared to others.

"We are a large university that is very keen on maintaining its image... They [the management] thought the implementation of SAP would bring new expertise and a new transformational environment." (N2-DM2)

➢ *Increased university size*

Company growth was one of the sub-categories that impacted on the previous ERP obsolescence decision rather than modifying the system, despite the fact that the previous ERP did an excellent job. But a basic ERP lacks functional depth to scale, since the university wanted to add more users and new modules, expand to multiple locations, have more functions and be accessible to new departments. The decision maker confirmed this:

"As the university improved, it increased its departments as well as its functions. As a result, new changes were required: for instance, the need for new and better quality employees was difficult due to the way the previous ERP had not been designed to match the new requirements and would cost the university more." (N2-DM2)

Similarly, another interviewee stated the following:

"All these changes needed heavy adjustments which the university could not handle; as we did not have enough professionals, including IT experts, software programmers and managers who were highly skilled in order to expand the system in a short period of time. The replacement was the option available to overcome these difficulties." (N7-M)

It is clear that expanding the university departments meant there was a need for new employees. Moreover, it also required re-engineering of the university system and redesign of the university's previous process in order to adjust to the new university situation, and consequently the need for new employees was critical to system continuance. However, unfortunately, there were no available IT experts with the standard that the legacy ERP system required to achieve improvements in measures of

performance, such as cost, quality, service, and speed. The decision was thus taken to employ an external contractor who had already re-engineered systems to a world-class standard. *"Newly contracted outsourcing IT staff would understand the benefits of expanding university size and re-engineering its process" (N6-M)*. Therefore, the replacement of the system and requisite new outsourcing IT and professional staff occurred, as outsourcing enabled an understanding of the expected benefits of expanding the university and re-engineering the existing system.

4.2.2.2 University business process changes

In addition to the above causes of ERP obsolescence, the change of business process was found to be another sub-category associated with the organizational issues. These business changes required a change to the legacy ERP system to be in the line with the new business requirements. The following section demonstrates these demands in more detail.

➢ *Connection between the university and external stakeholders*

The Ministry of Higher Education imposed many requirements to improve its colleges and universities across the country by applying a state-of-the-art IT project that could automate the universities with different public services in diverse ways, including administrative and teaching aspects, in order to meet the demands of e-government. There was also an internal desire resulting in a new objective for the university. Therefore, the legacy ERP software had to be changed as the new requirements needed new employees, as demonstrated in Sections 4.2.1.1 and 4.2.1.3, These new staff did not have the required capabilities and expertise to develop the legacy system.

"We realized that the university could no longer rely on outdated processes; we needed to connect the university with it external stakeholder as this would facilitate the required connections internally and externally that had been forced by both university and Ministry of Higher Education when, for example, processing the orders for items such PCs, Laptops, hardware, etc... Despite this, we had a connection before with different suppliers to serve the university; for example, the process of purchasing IT equipment was directly requested through the system, but there were some outdated data problems, due to the complexity of the processes, as a result of the official regulations that must be considered before purchasing any resources; and the way the system was designed made the modification even harder." (N2-DM2)

Another supported example given by IT staff was that the new university requirements made the system obsolete as the staff did update their skills to be able to make the new changes.

"The system became obsolete due to the new complex requirements and standards that needed a careful and deep knowledge for understanding the application of the new instructions to the university." (N17-IT)

The above quotations have shown that the problems of ERP obsolescence are mostly related to changes of process and requirements, which led to a change of software specifications, standards and soft resources.

➤ *Establish new e-management department*

There was a demand from decision makers to reorganise and change the way staff worked as they thought it would be easier than training and investing in the existing employees who had worked with the legacy ERP system by having new outsourcing IT staff and managers. However, it was not only the IT market in Saudi Arabia which was limited but also the available new staff had different capabilities which did not meet the skills and knowledge levels necessary for the system to function efficiently. So, in order to respond to the new process of associating with other public services, the need to change staff was made compulsory, which led to a change of software, due to the fact the new staff were more familiar with newer types of software.

As we can see, the university management thought that, by having a new e-management department with new systems and new skilled staff, they could run a new business from the university to develop local companies' IT systems and provide training courses for their partners.

As the above quote illustrates, there was an economic motivation for requiring new qualified outsourcing IT and management staff in order to increase economic efficiency. The university created this department to run a specialist business to sell certain services, such as SAP ERP, which allowed them to take advantage of scale economies. Due to this consideration regarding potential economic influence, the university were more willing to replace their legacy ERP system and make it obsolete.

4.2.2.3 Documentation Issues

This sub-category refers to the absence of recording and documentation of the previous working and analysis period of legacy ERP. As shown in Figure 5.6, this sub-category

of documentation issues consists of two sub-subcategories: a lack of official documents in the current context and no digital library of important documents of the previous period. The following sections presents these sub-sub categories in greater detail.

➢ *Lack of official documents in current context*

Form the data gathered, it was noticeable that the university did not have a formal document to deal with information systems in general and ERP particularly. This increased the possibilities of losing the essential documents related to the ERP implementation decision and its further maintenance. This was not only the case in this study case but also in Saudi culture: instead of conducting a rational analysis of data associated with a specific issue, top managers and decision makers lean on human knowledge as their trust in staff rather than the available document data, which is more subjective.

"Most ERP documents associated with implementation did not exist. This is not only about the carelessness of our staff but that we live in the nation that basically fully relies on words rather than formal document contents, therefore losing these files put the university in trouble as the staff were not able to solve ERP issues as they didn't have a clear picture of the whole situation." (N5-M)

The IT director also assured the researcher that the lack of official documents resulted in a lack of internal rules and conditions to the use of the information system at the university, as this point will be stated in more details in Section 4.2.2.5. Therefore, managers often tended to make decisions and have authority based on their personal experiences instead of documentation. The degree to which this influenced the decision is difficult to predict, as the majority of their decisions were determined by an external power. Furthermore, they were hidden in supporting documents which were not available at the university and thus were difficult to detect.

"Most of our problems related to not using files and supporting materials. We do not have solid instructions to record any issues related to ERP and the information system at the university. Moreover, as some mangers seek an external consultation for which the university did not save the formal documentation, we faced many problems, such as the manger leaving his job in the organisation. He took all the knowledge with him and we were not informed about the real situation." (N3-D)

> *No digital library of important documents of previous period*

Alongside the above sub-categories, the data analysis also proved that there was a lack of documentation, either digital or paper-based. Due to this non-availability of documents, the ERP replacement decisions were effected in a situation in "*We were unable to identify the required information to maintain system life, resulting in difficulties and problem solving for ERP maintenance to be classified*" (N16-IT).

This was also supported by the warehouse manager who pointed out that the lack of an e-channel to keep up-to-date with the university status in term of using mainly ERP systems impacted negatively on system maintenance. Therefore, the incompatibility and decreased connections between different departments across the university occurred.

"*We did not have electronic library to record the IS/ERP previous status and updated systems track which decreased the connection level between diverse managers across different university units. Staff kept their own knowledge among their project team sometimes and the rest stored in their own head, as we did not normally explicitly record and transfer the knowledge in e-documents to be available online for sharing proposes.*" (N6-M)

Similarly, DM2 and DM1 agreed, saying for instance:

"*I do not know when the other departments implemented ERP or why, as we did connect with them, we mostly applied the system that departmental suites and units needed; we did not care about or consider the other departments' needs.*" (N2-DM)

From the above explanations, it is obvious that the staff relied on subjective experience rather than documented action, either electronic or broadsheet. Nevertheless, another participant indicated the lack of a digital library or channel to link and share important ERP documents, which referred to worries about future consequences, as this kind of documentation in which they thought it would be evidence for any human mistakes. It also relates to the top manager culture, in that they did not want to take full responsibility for such e-documents.

"*We are the nation that does not prefer to document everything as the result of worries and threats.*" (N1-DM1)

Moreover, as discussed in Section 4.2.4.3, the regular changes of decision makers, managers and IT staff during ERP usage were a serious problem as those staff did not

record the ERP phases electronically or write it down formally. Therefore, new staff were unable to identify the issues related to the previous ERP period and difficult for IT staff to identify system issues and areas for revision and enhancement, including how the system was implemented, its objectives and staff tasks thus led to ERP system obsolescence.

This shows the importance of understanding the causes and underlining the causes of ERP obsolescence that led to system replacement without considering the interaction of the different causes, the replacement of the system will be considered to be a failure.

4.2.2.4 Reporting Issues

Reporting was one of the causes that directed the university to move to a new ERP system. Staff had difficulty retrieving data-reporting processes. This sub-category was caused by two sub-sub-categories mainly, unsolved problems and reporting delays, as shown in Figure 5.6, and the following sections will discuss these in further detail.

➢ *Unsolved problems*

There are many unresolved issues related to ERP reporting: for instance, DM2 claimed that system users and managers could not retrieve relevant information from the system due to the complicity of the report formats and its inappropriate contents.

"One of the reasons that brought up the idea of making the legacy ERP system obsolete was about reporting obstacles, since end-users complained about the reporting throughout the previous ERP system, due to the use of different report structures. The end-user was not familiar with these diverse types of reports and found it difficult to adapt; therefore, many inaccurate reports were created." (N2-DM2)

An additional issue emerged during the interviews with many different interviewees from both managerial and technical perspectives. For instance, the HR manager cited another reason interrelated with reporting problems that "*Refer to the regular change of decision makers and mangers as different mangers have different decision making styles."(N9-M).* Due to these differences, the system was not flexible to change and customised in order to satisfy their needs, but relied on preconfigured reports which created a different view of the data. If management needed a non-standard report, IT personnel were frequently required to create it.

"Normally, I asked the IT staff for their assistance to produce the customised report, as it was really hard for me to make even minor changes." (N10-D)

IT staff argued that this requirement took them away from other projects and work activities:

"Our IT Team members were assigned with too many responsibilities. We were not able to finish all orders that asked for customised reports." (N17)

These reporting capabilities became user unfriendly, requiring more training, and end users could not do this by themselves; which prevented executives and users from reporting on data and so they had to ask IT personnel for assistance, as supported by the purchases manager:

"I was not happy about the report structure; it is difficult sometimes to change and produce a report for different management units, as, you know, the IT staff had their own tasks to do. They could not leave their work and be available as their schedule was always busy and they had prioritised responsibilities. Therefore, I had to wait sometimes but if training in report writing had been offered it could have been avoided."(N5)

Consequently, reporting and analytical capabilities did not allow users to produce reports for executive management, financial management and operation and government regulatory requirements, which led to poor decision making and made system users dissatisfied, increasing the desire to replace the system.

➢ *Reporting delays*

There were also divers reporting issues relating to the legacy system, as there were no updated suppliers and staff files, they struggled to get the desired data, due to a lack of transactional efficiency caused by inaccurate data entry, as users did not concentrate while entering the data due to workload, as mentioned by the inventory manager:

"Sometimes, the overload of responsibility and trust on our staff increased data entry mistakes, as this affected the work quality and efficiency of inaccurate data entry in reports." (N7)

Another employee stated two different reasons which led to delayed reports; one was related to inexact inventory records in the system; the second was associated with poor systems interface and the complicity of system design.

As a result of these causes, the procurement order was delayed, and thus data was not available on a real-time basis. There was a lot of work behind the scenes to gather the

information necessary. Therefore, the ERP performance and efficiency impacted negatively by these factors, which contributed toward ERP obsolescence.

"The fact is that the submitted reports did not present information to the management in a timely manner. In addition, it was not possible to provide critical reports and data on the desktop that could facilitate the real-time supervision of the senior personnel. Furthermore, it was not possible to establish workflow alerts, the chief consequence being that, where important indicators were subject to alteration, it was not possible to rapidly send reports to the relevant staff; resultantly, efficient management and operations were negatively impacted. The system contained an inaccurate inventory record; it also referred to system design complicities and unfriendly interfaces. Thus, reports cannot be formatted on a real time basis and run as often as necessary." (N2-DM2)

Overall, the key point demonstrated by the DM2 was that it was not possible to format reports according to real-time and to operate them to the required level.

Resultantly, the capacity to report and analyse meant that the users could not generate the necessary reports for executive management, financial management and operation, and governmental regulatory specifications. Ultimately, this contributed to ineffective decision-making, and system users expressed both dissatisfaction and a willingness to substitute the system with something else.

4.2.2.5 IS implementation issues

The analysis of current research data determines different reasons that affected the previous ERP system and their negative impact contributed to its obsolescence. In addition, it is important to clarify this cause, in order to avoid any further replacement in the future, which also shows that the factors that led to ERP obsolescence are not only related to the software itself but also to a lack of control at the university level in terms of monitoring and updating their rules to match the ERP system requirements at the university. These causes are as follows:

- Misunderstanding of ERP requirements;
- Lack of internal governances to control the IS implementation;
- No clear measurements or criteria for choosing the vendors and products;
- Previous product's low level of popularity internationally;
- Lack of national experience in terms of dealing with ERP systems; and

- The nature of the decision-making process of IS implementation

These sub-sub-categories are considered to be causes that led to the ERP replacement decision that emerged from the data gathered, as shown in Figure 4.8, as clarified in the underlying causes, given below in more detail.

➢ *Misunderstanding ERP requirements*

Educational levels were not updated to match the ERP environment, which thus led to a misunderstanding of ERP tasks and staff activities, the resources needed and knowledge required. These contributed to ERP obsolescence. Due to the lack of training and education levels in relation to the new ERP environment, ERP usage, including inaccurate data, directly affected the quality of the report and lost the main purpose of the ERP.

"Local ERP workers, including technical and managerial employees at all levels, did not have the high standard of qualifications and training. These were noticeable in incorrect data entries and in a final report, so, as far as I know, these different employees were not involved in the ERP training period." (N4-M)

Staff did not receive sufficient training, as mentioned earlier in Section 4.2.1.4 and this refers to the training strategy employed to train the end users. This strategy was more selective and objective, in which the staff involvement was based on decision maker opinions and relationships with the staff. This will be discussed more in Section (4.2.4.3).

This misunderstanding of ERP system might lead to unwise and proper ERP replacement decisions, as specified by M3:

"The lack of A comprehensive understanding of ERP tasks and its required functions impacted negatively on the overall ERP decision, including ERP obsolescence, which is more likely to affect the outcome of the system at the university." (N8-SD)

Another interviewee stated that, due to the lack of education, staff often failed to understand ERP tasks and activities, increasing the failure to meet the system objectives and its requirements. ERP workers were not confident about performing their ERP jobs, as they did not have enough working knowledge of the software package, as supported by M:

"Education is slightly different to training, in that it provides staff with knowledge regarding the purpose and methodology behind their activities. Staff, at all levels, were not effective due to the lack of understanding of the concepts required to do their jobs." (N9-M)

The university did not take the responsibility of educating their workforce seriously, as they relied on and cared more for external recruitment.

"You know that we did not have sufficient preparation and knowledge about the ERP system and it was a first experience for us. Most of our top managers went to ask an externally qualified IT company for their difficulties with ERP." (N17-IT)

Similarly, the IT manager argued that, despite the fact that education should commence early on in the implementation process, ideally prior to package selection to allow key staff to correctly evaluate the company processes and needs relative to the different software solutions available. This would in turn allow the management to make a fully informed decision during the selection process which can then be justified and related to end users of the software. But this is not the case for the university under investigation, since top managers cannot perform and control the functions well in-house including organizing, performing and evaluating work, and therefore were advised to transfer it to qualified external contactors for their assistance regarding all ERP matters.

"The deficiency of education in the ERP system early on in the implementation process made the staff unable to evaluate the organization correctly, select the best available solution or be aware of the differences between the different systems. If the university does not solve and consider this problem carefully it will go recur in the future." (N13)

Many interviewees agreed that the underlying causes of these absences of ERP understanding was that the ERP had not been introduced as a subject at HE level. These causes will be discussed in Section 4.3.1.2.

➢ *Lack of internal governances to control IS implementation*

It was obvious from the data analysis that there was a lack of an internal control system at the university. As result, the highly impacted on the loss of control over the project and loss of monitoring of staff and updating their knowledge about the system, as this increased the possibility for the project team to take complete control of the ratification of its own ERP replacement decision, without considering other important components

of the decision, such as existing IT staff involvement and even failing to evaluate whether there was a need to make the legacy ERP system obsolete or not.

"The non-existence of appropriate internal controls such as corporate governance, meant poor monitoring of ERP system processes and decisions. Basically, managers had almost the comprehensive authorisation to create and implement unsuitable solutions; however, this increased the risk of losing the main purpose of the ERP system." (N14-IT)

Another view put forward by the HR manager was that the project managers acted in their own interests rather than in the best interests of the organization, due to a lack of committees and lack of insurance of responsibilities by the university to monitor any IT projects and examine its achievements in a timescale, and insuring that the plan is based on the university objectives and its budgets instead of the project manager's objectives. This led to a lack of accuracy in this tasks and thus an absence of protection of the legacy ERP system lifecycle and loss and misuse of university assets.

"The university did not inspect the IT project resolutions to see if it had achieved its aim based on the university's goals, according to the agreed plan and procedures, or not. In fact, the loss of internal control and a monitoring system allowed the project manager to have their limited plan and brought a lack of clarity to the process of making such ERP replacement decisions. However, I can say that we were out of control, as the decision was simply taken over by the decision makers and project managers who had their own approach to selecting staff and control for the system duties based on their relationship and for their own concerns. As a top manager, I was not satisfied, as we were in a dilemma as a result of this loss of a university control system." (N9)

Likewise, DM1 also highlighted that *"The university does not have powerful laws to manage and clear regulations to deal with IS process." (N1)*

➢ *No clear measurements or criteria for choosing vendors*

This issue is related to the lack of an internal control system. Many interviewees also stated that the university had a lack of clarity in term of selecting the vendor; such measurements were not applied to examining the matches of vendor type with university requirements and status.

"Basically, we did not have internal strict laws to guide the process of choosing the IS/ERP vendors and its suitability with the previous situation; it was all about rules and decisions imposed by the project manager's team." (N10-D)

The financial manager also reinforced that the lack of formalisation procedures for selecting the suppliers affected the application of information system in the university under study, based on the relationship of the project team with the vendor, instead of asking local qualified IT workers and managers for their opinions and their knowledge. It seems that the vendor capabilities were not the priority of the leadership to make such replacement decisions.

"The way the system was selected in order to replace the previous ERP system did not satisfy me or even any of our members in the IT departments, we were excluded from the decision… Despite that we were more aware about the legacy ERP system and all issues related to it but the project manager suddenly ask for external company assistance to select the system. This company had previous connections with the leader of the project." (N4)

The ERP project would thus end at the end of the project manager's tenure, and would also end vendor support. This view was emphasised by the IT manager: *"We know the selection of SAP was not our selection or even the IT team's. The SAP would be ended and replaced one day as any IS applications that implemented based on unnecessary circumstances, such as relationship benefits of vendor and project manager." (N13)*

➢ *Previous product low level of popularity internationally*

This sub-category of system popularity has already been discussed in Section 4.2.1.4; this section summarises that discussion and offers some brief thoughts on it. The popularity of the system was one of the IS implementation problems at the university and in Saudi organizations in general. The international popularity of the system and global competition were the main criteria for the organization applying any information systems, in contrast, neglecting the important factors that needed to be considered to successfully meet the organization's objectives: analysing the extent to which the new system was compatible with the university structures and the response to the system maintenance issues. Nevertheless, it needs to be noted that the system's reputation appears in two sub-categories, namely postponement obsolescence, and organizational influences. It is because this barrier is not only related to system issues, but also can be

considered as an organizational issue, due to changes of organizational environment and decisions, that it can influence the idea of its popularity, either at the university, system or managerial levels involving the neglect of a thorough analysis of possible outcomes as result of narrow down thinking, which aimed to reach a high level of competition rather than long-term success. As stated by IT: *"Even SAP did not have enough experts in the region, in which the SAP market is more risky, because of the high competition for worker required in the middle East and gulf region." (N15).* This quotation indicates that system popularity was a very strong driver for the university but the new system could not succeed as this short-term plan did not consider the availability of specialist workers. It was also mentioned by many interviewees that what happened to the new ERP system was a result of the non-availability of qualified IT staff.

➢ *Lack of national experience of dealing with ERP systems*

From the data analysis, the emergence of the ERP system occurred in Saudi Arabia in the ten years prior to this study being undertaken starting with private organizations, then being employed by public organizations, in which the majority of staff responsible for different ERP tasks, including technical, functional, operational and managerial were foreigners. In other words, the ERP system was operated and managed by external contractors due to the lack of ERP experience in the local market, and an over-reliance on non-national staff, thus the local staff did not have the chance to share their proficiencies with ERP experts such expertise remaining exclusive to the overseas specialists.

"Despite the fact that dealing with systems such as ERP is a great opportunity for us to learn and gain more knowledge and expertise, in fact the organization ran the majority of ERP tasks and training for feigners. How then can we practise and gain more knowledge of the system if we are not involved in such processes? You know that the ERP appeared in Saudi Arabia in the last ten years. But still the local staff cannot get the experience required, as they are normally excluded from training sessions, therefore we cannot even share and learn about the system from these foreign workers." (N8, SD)

DM1 referred to the absence of a qualified and trustworthy IT company that could provide ERP training and courses, even if the high cost of the training courses prevented many local self-funded staff from taking apart on such training. They chose not to spend their money on non-trustworthy and low-level courses.

"We cannot trust the local IT vendors; they provide courses with duplicated costs which not all of us can afford." (N1)

Warehouse managers also claimed that the culture prevented them from practising IT project tasks, as *"The practise is where the knowledge come from" (N6),* but unfortunately most IT projects were transferred to outsourced foreigners staff and qualified contactors.

Therefore, as stated in Section 4.2.2.5, the ERP decision was strongly influenced by this culture and the existing workforce could not perform and control such IT services.

➢ *The nature of the decision-making process of IS implementation*

The decision-making process is another sub-category that greatly influenced ERP obsolescence at the university, as many of the interviewees mentioned that most decisions in this context were more likely to be centralized, due to the hierarchal structure of the university, giving authority and power to managers who had insufficient knowledge and expertise regarding ERP projects.

"The top management groups represented by the head of the university… asked me to implement the change." (N2-DM2,) which means no rules and requirements for decision makers in IT decisions was required. This point will be discussed further in Section 4.2.4 in order to clarify how insufficient authority built into this university affected the ERP replacement decision. In contrast, insufficient powers were provided to IT experts who were more qualified and knew more about the system.

"The decision was made by the top managers without our involvement or even consultation." (N11-IT)

The system director recalled that the IT group were unsatisfied about being ignored in such an important decision. He decried the *"Inappropriate IT decision, as any information system decisions needs an extensive solid background to avoid any undesired accidents in the future and this background cannot come without the use of our in-house staff and local expertise at the university. (N8).* This exclusion reduced the motivation of existing staff to work and increased the conflict between the top management and decision makers across different departments and units at the university.

"The IT staff and system users were unwilling to work as before, as they felt they had lost their right to participate in improving their daily tasks as they are the users of the system… It also raises a conflict between top managers in diverse department and faculties." (N7-M)

As you can see from the above discussion the IT decision gave power to insufficient staff, being a centralised decision which relied on the influence of top managers. Therefore, the possibility of making the decision based on the interests of those who had the power rather than on organisational interests build and implemented the decision to replace or make obsolete the ERP system was affected by this particular management context.

4.2.3   Human Resources Obsolescence

This research not only shows that ERP obsolescence refers to organisational obsolescence factors/issues but it also shows that other soft resources influences, such as human resources obsolescence, emerged as a sub-category that led to ERP system obsolescence. Human resource obsolescence occurs in the form of skills and knowledge of computer hardware, databases and software becoming obsolete, in which these capabilities impacted on the ERP system development and make it no longer wanted. The extent of human resources obsolescence can be observed by the quantity of training and certifications available. This in turn is presented in two sub-sub-categories. Firstly, skills and knowledge were not updated. Secondly, professional specialist availability was unavailable, as shown in Figure 4.9 below.
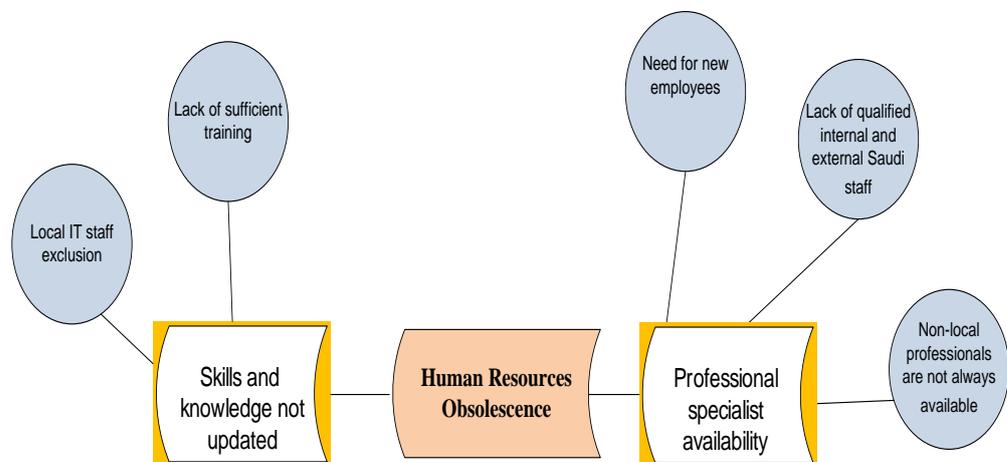
Figure 4.9: Concept map of Human Resources Obsolescence

4.2.3.1 Skills and knowledge not updated

The presence of staff with outdated skills and low levels of knowledge about information systems' skill requirements is highly relevant to ERP obsolescence, as perceived by different employees, in the form of the inability to use the latest computer hardware, software and database applications. At the organizational level, it was clear that there were low-skilled staff who did not have adequate skills to match system requirements. For instance, staff who worked with the legacy hardware of the system did not have the abilities and knowledge required to run the new hardware; thus, their skills became obsolete and incompatible with the new ERP system. This also happened in the case of the software and database for the same reason, as identified in 4.2.1.1, as suggested by the system director:

"As you know ERP is information system software that requires hardware and a database, both components need highly skilled staff to avoid any defects that might happen. To give an example, the existing staff did not have the capabilities to improve and run the extensive system maintenance due to their outdated skills and their low-level abilities, which prevented them from dealing with systems such as ERP. Therefore, the system became obsolete." (N8)

Another interviewee put this issue in a wider context of the likely mismatch between systems and people, suggesting that finding people who could use the system to its maximum potential was very difficult:

"It is easy to replace the system but difficult to change and deal with the human side." (N1-DM1)

It emerged from the data that outdated skills existed for two reasons, as follows:

➢ *Lack of sufficient training*

Another factor that impacted on ERP obsolescence was the limited number of courses and the low quality of training. The financial manager claimed that the training times and the number of sessions were not adequate. According to the director of financial application management and administration, "*We tried to cover too much material in our courses, programs, but the time was limited*" (N10).

Another view that also refers to the inappropriateness of the ERP training program came from the HR manager, who argued that ERP training did not satisfy the diverse training needs of different ERP stakeholders, including managers, IT staff and

operational and functional staff. As the training course was not separated to cover all the different users' needs at the university, each of these diverse groups had different responsibilities in relation to operating and running the system effectively. It was therefore expected that they would be trained according to their specialism rather than in a generic way.

"As manager, I did not feel satisfy about the training given to us. This was also true for my colleagues, the training was not accurate enough. All of us, including IT staff and other system users took the same course, despite having different ERP tasks. I do not think that I need to attend or participate in such a general course which was designed to cover technical aspects of the system instead of focusing on management aspects. The university should provide more intensive programs that are specifically and separately made for both managers and system users." (N9)

Moreover, the university had a very large group of workers with low educational levels in computerised information systems. These workers were not treated, guided and trained properly and this led to significant data entry errors and data quality issues.

"As a large university, we already had a large number of staff with different educational levels, in term of technology use. Unfortunately, the majority of our workers did not have sufficient skills to deal with the change. In some cases, data errors occurred as a result." (N11, IT)

In addition, as a result of the advanced course content involved in attempting to upgrade IT staff skills over the short term and in choosing to involve only certain employees, based on the relationship between decision makers and their staff, people were less willing to attend further training and were less motivated about being involved in system development and problem solving.

"It is not about how many times we attended the training course, it is about who did it and what expertise the trainers had, who was involved in the training and what the materials given out were for. As a manager, I can tell you the outcome of this type of training was not satisfactory. If you want to train your staff in the organisation, you have to look at different aspects of their expertise and knowledge before going further at this stage. For example, you need to test their levels and willingness by preparing them and realise the degree to which they will accept training, as most staff have relatively low levels of education." (N13-M)

The same participant identified one of the key underlying issues undermining the effectiveness of staff training as being the way potential trainees were identified:

"Unfortunately, choice of participants was based on their relationships, instead of selecting them by their qualifications and department needs throughout the training period." (N6-M)

In other words, it seems that only a small number of individuals closely connected to management received the necessary training, while the majority of staff was not involved.

Moreover, a number of interviewees argued that the insufficiency of the training created problems, including users being unwilling to participate in any training sessions and elderly workers finding it difficult to understand and accept course content. It is therefore to be expected that, due to the inadequate change management method, the training efficiency is likely to be low, as expressed by this interviewee:

"It is not about the quantity of training and certification available for both trainer and the audience, it is about the strategy of encouraging those targeted people. There was a weak change management approach; people did not form the change management team early enough and some did not even know what the change was for." (N15-IT)

As stated above, forming the change management team in advance of implementation impacts on human resource obsolescence, as does effective preparation of relevant staff who will play a role in ERP implementation.

➢ *Local IT staff exclusion*

Despite the fact that human resources are considered to be the fundamental elements for long-term success for any IS project, the organisation studied, instead of investing in their workers by giving them various training opportunities, excluded most Saudi IT experts and system users from training programs for several reasons, mainly due to the country not being as advanced as others, especially in relation to the use of technology to promote learning. Firstly, some Saudi employees do not have the abilities that the foreigner workers have, which includes taking their responsibilities seriously, discipline at work, being more willing to work overtime and punctuality. Secondly, foreigners tend to be less expensive for Saudi HEIs to employ, given that other countries have lower average wages than Saudi Arabia. As a result of these factors, local staff tended to be excluded from roles at the university. Moreover, local workers tended not to have

the qualifications that migrant workers were more likely to have, due to the fact that the Saudi Arabian educational system at the time of writing had comparatively low achievement levels, as stated by the IT manager:

"Not all our Saudi staff were in the training program… The abilities of foreign staff are much better than Saudi staff, and they have higher qualifications and levels of expertise in technology... Over and above this, their willingness to do overtime and to complete tasks on time, and the low payment they require for the job are the reasons why the Saudi HEI market is dominated by foreigners." (N13)

Another reason which emerged from the collected data was a lack of trust in local staff expertise, as this decision maker highlighted: *"In cultural terms, we value those foreigners who have this qualification from abroad." (N2).*

Similarly, another view emphasised the following:

"The university did not train the former staff for the new system, which meant that most of the Saudi staff were still working with the outdated system due to their total dependence on foreigners and the exclusion of Saudi staff… Foreigners are more flexible to deal with in the workplace, as they tend to follow the directives of their supervisor." (N7-M)

Finally, there is an additional reason for staff exclusion. This is the significant period of time and amount of effort required to train up local staff with up-to-date skills and knowledge, which thus prevents the growth of the university in the short term.

"I am not keen to train the previous Saudi staff as you know this will take a long time and extensive effort, which we do not need to do. I think that, as a leading university, we want to save this time to improve the university performance by employing staff who already have professional skills and are well trained. Others universities still stick with their systems and try to find professional workers to operate their system. This creates competition in which institution will grow most, first locally and then internationally. Therefore, saving time and effort is the best way to help build on our top position in the region." (N1-DM1)

It is clear from the above that the university's ambition to compete internationally led them to choose more specialised staff from other countries, and therefore to exclude local IT staff from key roles in the department. This aim led to the perceived need for

rapid change to be made to the university's IS system, and thus to employ already fully qualified and experienced staff to implement the replacement process.

4.2.3.2 Professional specialist availability

This sub-category refers to the specialist's availability on the national scale, as discussed further below.

➤ *Non-local professionals not always available*

Since non-local professionals were invariably better qualified to lead the ERP replacement process, it is understandable that the university sought foreign experts to deliver effective system maintenance and revision. However, the intensely competitive market meant that it could not retain the highest quality staff, as the decision maker explained: *"The high market demand and partner competition to recruit qualified IT/ERP experts threatened the life of the ERP system when the university lost skilled staff." (N1)*

The difficulties involved in hiring highly skilled replacement IT staff led to the decision to make the previous ERP system obsolete, despite having failed to hire a high-skilled ERP expert to lead the process. This was a critical risk that threatened the continued success of the system at the university, as one interviewee suggested: *"We tried hard to find highly qualified specialists in both IT and management but we were not able to attract as many as the system required, in order to work efficiently." (N13-M).*

Another reason the university had problems maintaining high quality leadership in this area was due to the issue of visa regulations. Although, the Saudi market preferred foreigners, Saudi restrictions on employing foreigners made it difficult for the university to find such specialists. More details about these issues will be discussed later in Section (4.3.1.1).

It can be seen that external factors, such as the impact of both the private sector and government policies on the recruitment of highly skilled staff, had a major impact on ERP obsolescence in the case under study. Furthermore, this shows the importance of understanding the interaction between the internal and the external environmental obsolescence influences which impacted on each other and made the previous ERP system obsolete.

➢ *Lack of qualified internal and external Saudi staff*

Most Saudi companies, including public and private ones, exclude their local employees from training programs, as stated in Section 4.2.2. Top managers always prefer non-local staff from both international universities and companies, who have up-to-date qualifications and high levels of expertise. As a result, the workforce did not receive adequate training in their job. Thus, they could not exploit the opportunity to become professional experts in their own area.

The IT manager stated that this issue related to the nature of the education system in Saudi Arabia, which focuses more on the theoretical rather than the practical side of information technology and memorising things rather than using critical thinking skills. In other words, the university employed a traditional teaching method, such as paper materials, instead of learning and practising functionality and applying technical skills to real life situations.

"Mostly, the classes and courses included a traditional theoretical teaching approach instead of practising real-life situations, therefore they were not qualified to enter the IT market and gain more expertise." (N13)

The system director argued that *"Despite this, Saudi employees had the abilities, knowledge and skills to allow them to work professionally but they were neglected by their internal and external communities, as they did not value the initiative of local staff, therefore the majority of Saudi employees preferred to work outside Saudi Arabia or to leave their job to run their own business. The lack of awareness in the Saudi community of the skills that Saudi IT professional have and the lack of incentives available to them, means the Saudi IS projects is in danger of failing…We know how many postgraduate students study abroad. However, I have not heard about their innovation and distinctions being mentioned in our universities. Nowadays, we hear a lot about creativity, rewards and innovations developed abroad across the media. The environment plays a significant role in equipping these qualified students with the advanced skills needed to become professionals in their field, while they are abroad they receive much support and encouragement in order to meet the global trend requirements, which is not available in our home country environment." (N8)*

According to this participant, it has become clear that the Saudi market is threatened by its dependency on foreigners, and local qualified Saudi staff are ignored. These foreign

experts will return to their own country one day, and the system will then be at risk in terms of maintenance and training. In other words, non-availability of these people will disable the functionality and efficiency of the system, as happened at the current university. Therefore, the university needed to make the ERP obsolete and replace it. This is supported by a decision maker, who stated *"I am extremely worried that these foreign workers will leave the country. How will the system work then?" (N1)*

As you can see from the above discussion, this section not only explained how the skills became obsolete, but also clarified how the manager played a role in making the staff skills and knowledge obsolete. Therefore, understanding the link between these factors is vital to the ERP obsolescence decision and for decision maker to avoid unnecessary replacement.

➢ *Need for extra employees*

When new organizational changes were introduced at the university, such as adding a new ERP module and new function, this required extra employees to be hired to operate these systems changes, due to an increase in maintenance needs. This is because the university was not able to further improve, resulting from an incompatibility between the skills required to maintain the system and the skills of the newly recruited IT staff. On the other hand, rapid changes in technology impacted on the availability of sufficiently well-trained IT staff. Therefore, the productivity of end users and information systems specialists is affected by skills obsolescence. Professional skills in this field must always be upgraded on a regular basis because their existing knowledge becomes obsolete in a short period of time.

"The system required a huge amount of maintenance and monitoring, which the existing employees could not handle. However, the available staff did not have the skills to match system requirements, which led to an incompatibility between both. As you know, technology advances and changes regularly, this meant that those members of staff with outdated skills were no longer wanted. This resulted in difficulties in the use of ERP at both operational and managerial levels." (N3-D)

The above quotation also shows that not only did managers in organisations made staff skills obsolete but also other external influences, such as IT market skills. As the need for new staff who had updated skills made the existing staff that had outdated staff skills obsolete. In addition, the new employee skills did not match the previous ERP

system skills requirement. Therefore, managers felt it would be easy to change the system but it is difficult to change human skills, which takes more time. *"It is always easy to replace an information system than change people's skills and attitudes toward the ERP system" (N2-DM2)*

Consequently, as mentioned earlier in this section, it is critical to understand the connection between the different factors inside and outside of the university in relation to the ERP obsolescence decision.

4.2.4 Management obsolescence

This research study shows that obsolescence is not limited to inadequate knowledge possession but rather to other management obsolescence factors. According to a number of the interviewees, management obsolescence was related to top managers from different departments, IT managers and decision makers, which meant that the ERP was no longer wanted due individual management style, mechanisms and behaviour. This applied in the form of a lack of guidelines in the organisation which led to a substantial gap between the system requirements and staff responsibility. It also depends on the inability of managers to keep up-to-date with the demands of system and organisation changes which thus led to change of manager. The new manager has a new different management style, perception and attitude toward IS/ERP at the university. Consequently, the new manager directed the situation to ERP obsolescence.

To be more specific, this section discusses four sub-categories, namely 1) Top management influence; 2) Decision makers' issues; 3) IT staff responsibilities; and 4) Lack of vision, as shown in the figure below:
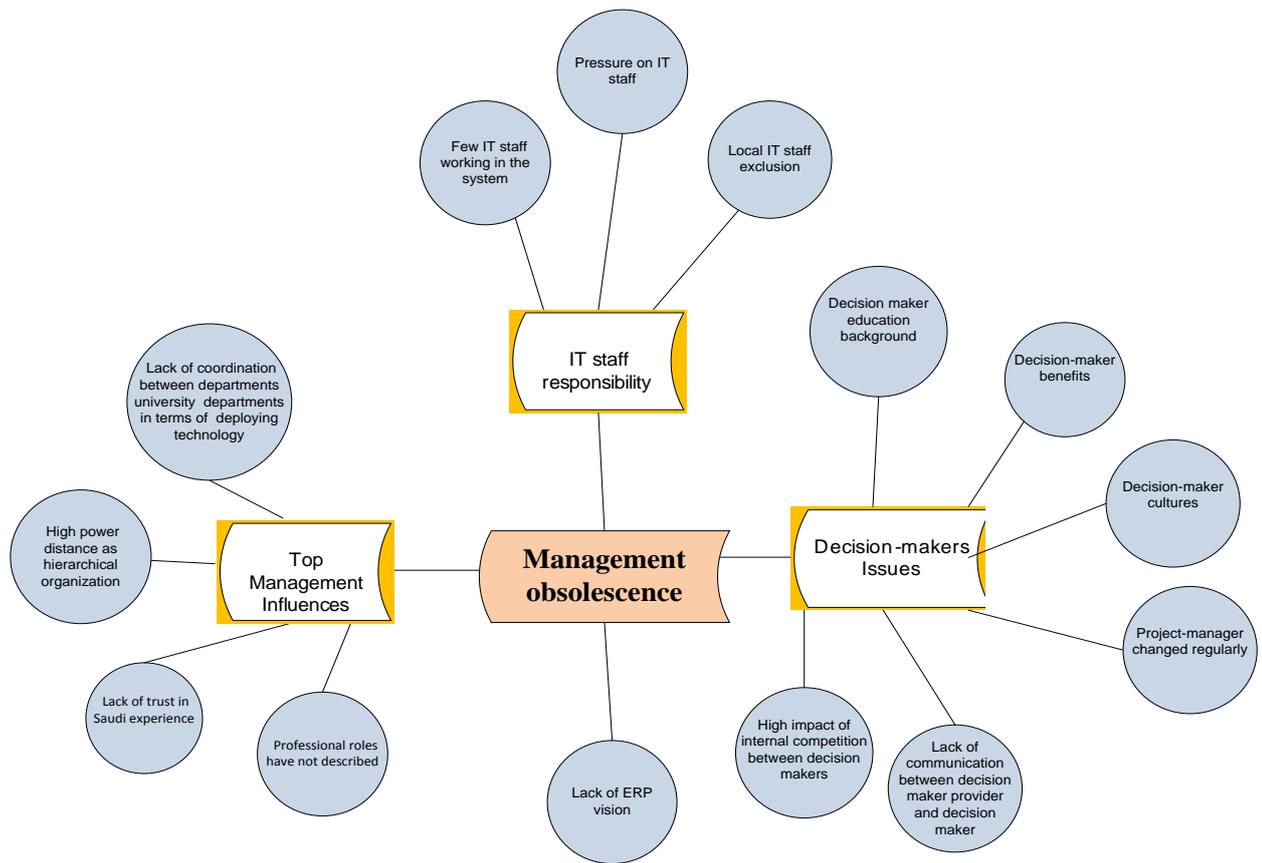
Figure 4.10: Concept map of management obsolescence

4.2.4.1 Top management influence

This sub-section explains how the way of top management and its reaction to the system, staff and organisation make the ERP system obsolete, and in this way was influenced by four factors belonging to this sub-category, as follows:

- ➢ *Lack of coordination between departments in terms of deploying technology;*
- ➢ High power distance as a hierarchical organization;
- ➢ Lack of trust in Saudi experience; and
- ➢ Professional roles not described.

From the conducted interviews, it was clear that the university suffered from an absence of coordinated decision making in terms of ERP implementation among diverse entities involving unit and faculty managers, which made it difficult to integrate different modules that are closely linked to each other.

As top managers were unwilling to share their knowledge, expertise and opinions in order to ensure the success of the ERP system, it seems that individual decisions made

departmentally maximised the possibility of incorrect decisions being made, with accompanying unsafe outcomes. This was caused by senior management handing over responsibility for implementing ERP to the managers of each separate unit, across the entire university. In other words, no collective decision making was instituted between different departments in relation to IS implementation, as stated by the decision maker:

"The decision across the university was a business owner decision, which meant each administrative unit made its own decision. It was not 100 percent an individual or collective decision; it was all based on the decision makers in each unit in the organisation" (N2). As a result of this policy, insufficient collaboration and communication mechanisms between diverse working groups and units led to incompatibility between different IS applications, as discussed in Section 4.2.1.3. Furthermore, another consequence of this policy was that it made it difficult for an efficient cross-functional team to be formed, in order to conduct overall planning and further system improvements and revisions. This brought about a reduction in operational efficiency and performance of ERP at the university.

"The current status of deploying information systems at the university are affected by those who made individual decisions for different departments. However, we did not even have contact with these departments. Each top manager made their own decision and was unwilling to share it with other departments, as they thought there was no reason to share." (N3-D)

This response indicates that the university authorisations and regulations given to departmental management allowed them the right and freedom to apply an information system of their choice in their department, as discussed in Sections 4.2.2. The reason different managers chose different solutions in this regards is that it was much more important for them to ensure the success of their department, in order to boost their future career prospects, rather than to improve the reputation of the university as whole.

➤ *High power distance in a hierarchical organization*

High power distance is another sub-category that emerged from the analysis of the interviews. As any public university, the hierarchical structure is considered a characteristic which is more likely to result in a high power distance, especially in the Saudi context. This section reflects how the work context and the organisational structure can impact on management style, as an IT staff member pointed out:

"As a hierarchical university we do not have the authority to make decisions for any IS decision or other decisions in general. It is by virtue of the top managers, who represent the head of the university and decision makers, where decisions are made, privately and between them. By contrast, I was present at the meetings, but the decision-maker was there just before the meeting, and they wanted to inform us about the updated decision. My opinion was required but probably not significant. They asked me and my colleagues just for appearances, and it was not clear if they were taking in our opinions or not. However, the final decision to replace the ERP system was imposed on us and was highly influenced by the power distance in the organization. I hope that they can consider our opinions to improve the use of the ERP system." (N14)

To summarise the above quotation, power centralisation and centralised decision-making are direct results of a high power distance. This power centralisation allows the leader of the university to issue centralised decisions and to unilaterally change some parameters of the ERP project, and increase the possibility of making mistakes. Without collecting and considering alternative ideas and meaningful contributions from a wider group of people, it may be difficult for top managers to identify potential problems and risks related to their decisions from both a technical and managerial side. The most negative consequence of centralised decisions is the incompatibility between different IS applications at the university, as mentioned in more detail in Section 4.2.1.3.

More importantly, top managers may not have as much know-how regarding the ERP system as the IS specialists in the company. As IT staff stated *"We are more highly qualified than managers, who do not know about the technical aspects of the system. Thus, it is wiser to negotiate the decision with IT staff instead of making individual decisions. Regardless, I lack the authority to say this, as we are a public hierarchical university which means decisions are power-based and not experience-based"* (N12).

In addition, it seems that the important decisions were not only made based on the position of the authorised staff in different organisational units, but also on their relationships with the head of the university. As a result, if they had their supervisor's trust, they would be willing to offer more actual power. Otherwise, a person may not be able to get as much power as they would otherwise have.

"At the university, despite the fact that the decisions are normally made by individuals who possess relevant levels of power, this is based on their personal relationship with

the head of the university, as the latter trusts the decision maker to handle all issues related to the IS project. "(N17-IT)

Therefore, the nature of the decision-making process is affected by those who have inappropriate authority. As an IT manager mentioned, by giving the top managers the right to choose and make centralised decisions, this allows them to use their own strategies to make such decisions.

"At the university, most of the IS-related and other organizational decisions are regularly made through ultimate power and authority controlled by a few people at the head of the university and decision makers. They have their own strategy to make their decisions. This strategy is based on their consultations with the external IT Company and IS vendor. They confirmed the decision with the rest of us. However, we did not have the power to say anything about this." (N13)

Consequently, inappropriate decisions regarding IS issues, including system maintenance and development, choosing and employing the appropriate human resources and new resolutions in the organization, will lead to ERP obsolescence.

➤ *Professional roles not clearly described*

Professional roles are broadly defined, and normally concentrate on information management and IT roles. Both roles also possess sub-roles that require a variety of different skills, depending on the sectors in which the person is employed, and these roles need to be identified and described in detail in the signed contract and agreement for clarification and to avoid any agreement problems in the future. In contrast, the analysis of data gathered found that there are underlying causes that impact on ERP obsolescence, including *"the ambiguity of professional role"* and *"conflict of role"*. Role ambiguity refers to the lack of clarity, transparency and understanding of the required tasks that must be done by employees, and conflict of role refers to the conflicted instructions and incompatible guidelines imposed on employees by their direct manager at the university.

"Between the period of conducting job interviews and signing a contract, there was no discussion about the overall tasks that were required of me in my department. All I knew was the title of my position. However, as an IT specialist I have multiple skills and abilities that allow me to be more flexible in that sense. There were occasions where I faced many problems as a result of the ambiguity of role, and I was overloaded with

work from different managers in different departments. Thus, I was confused by this conflict of role, as it was not my role to do others' jobs that required different skills and efforts. However, managers left their jobs to me with the excuse that they do not have enough staff to finish the tasks and were unwilling to have new staff undertake them because they did not have such high-level skills, which meant that the manager trained them or asked me to do the task." (N11-IT)

A consequence of the *"ambiguity of professional role"* and *"conflict of role"* is represented in low performance, low job satisfaction, rising frustration and work pressure on employees. Therefore, staff members decided to leave their jobs.

"You do not know how much work we handled to improve and modify the ERP system. The IT group and I were suffering a lot, as our direct mangers asked for many tasks to be done and other bosses from diverse organization units also had different requirements. Once this occurred most of the group members were unwilling to do the work and the rest of them left their jobs." (N14-IT)

Another interviewee raised the point that some positions were occupied by low-skilled individuals who had relationships with top managers, as they were not qualified enough to work sufficiently in their daily activities. Thus, managers asked high-skilled staff to do some of their tasks.

"Our internal environment imposed illegal instructions issued by our top managers, who had the authority to make most of the decisions at the university. For instance, some of the IT group and management group had unqualified staff, and these employees got their jobs based on their relationships with those responsible for such decisions. Therefore, they cannot handle the most important tasks in their occupation and their managers distribute their tasks to those who have more skills and pressure them into doing someone else's work." (N16-IT)

This lack of clarity and subsequent conflict in both professional roles and university roles in terms of employing staff meant that the performance of both individuals and the organization overall will be low, which prevented the success of the ERP system and then made it obsolete.

4.2.4.2 IT staff responsibilities

This sub-section shows how the managers' strategy of employing staff played a role in the ERP obsolescence. This strategy included the exclusion of local IT staff and

pressure on IT staff, which contributed to the previous ERP system obsolescence. These two factors will be discussed in the next section.

> *Local IT staff exclusion*

See Section 4.2.1 and 4.2.3, Management had a significant role in human skills obsolescence and system obsolescence as result of staff exclusion. Therefore, this code will not be discussed again here, which also shows the interrelationship between the different types of obsolescence.

> *Pressure on IT staff*

The data indicates that there was a shortage of staff, so the staff felt pressurised by the work environment at the university. IT staff stated that many staff left the university due to the management and how work activities were organised.

"You do not know how much work we handled to improve and modify the ERP system. The IT group and I were suffering a lot." (N14-IT)

Another interviewee raised the view that managers asked a high-skilled people to handle the work as most of the available staff were low-skilled in terms of technical and functional activities. IT staff mentioned the organisational authority which let managers choose their own work methods.

"Our internal environment imposed illegal instructions issued by our top managers, who had the authority to make most of the decisions at the university. Most IT job roles were done by few of us who are high qualified." (N16-IT)

4.2.4.3 Decision-maker issues

Since decision maker roles and contributions in any IT/IS project differ from those of managers, this study has also shown their influence on ERP obsolescence was also different. For this reason, these two key holders were separated into two sections. The previous section illustrates the managers' influence; the next section discusses the decision makers' influence.

> *Decision makers' educational backgrounds*

The application of coding and comparative analysis to the data gathered confirmed that the educational background of the decision makers greatly impacted on the decision-making processes, including past experience, educational levels and international

qualifications. As the decision makers and decision providers in the instance of the case studied had high qualifications from western countries, their decisions and their way of thinking and dealing with problem solving was highly influenced by, and tended to follow, western ideas and approaches in terms of technology development and deployment. They did not carefully consider the differences between the Saudi and western contexts, which involve organizational cultural, economic issues, governmental policies and human resources availability. Their primary concern was about copying practices in developed countries in order to compete internationally. This is very clearly demonstrated by a decision maker:

"I gained my Master's from the US and my PhD from the UK. I also had many experiences during my study abroad, as well as building relationships with different IT professors, all of which gave me the chance to think about why we were still using the legacy ERP system, which did not provide us with any credit internationally. Then I thought about the western universities and how they succeeded in using SAP; from here I suggested using SAP at the university" (N2).

It seems that many local IT and management staff had local qualifications and experiences and was more aware of the consequences of following the western approach in deploying the latest IT, based on the comment of one of the IT staff members:

"The decision was unwise, since it just meant following the western trend. We all know that SAP has not been implemented in any public university here, due to its complexity, and we are a governmental institution which has to follow many different rules and policies. However, the decision maker had a high-level qualification from a western university, which means his view was more valued than others', but if the decision neglects the most important factors which have to be taken into account, what do you think the outcome will be?" (N13-IT)

It can be seen that decision makers and IT staff had different perspectives on this key issue. We can see that educational background impacted on the decision-making process, which played a part in the resulting ERP obsolescence.

➢ *Decision-maker benefits*

From the analysis of the interviewees, there was a clear indication that allowing ERP obsolescence involved personal interests, in which those interested referred to the

benefit of implementing new ERP systems as well-known as SAP in order to build relationships locally and internationally with world class IT professionals and IS vendors. By undertaking this type of connection, the decision maker made his reputation in the IT market locally and internationally. Moreover, gaining the trust of the Ministry of Higher Education and the university also added new experience in analysis and problem solving skills, derived from the best qualified managers and IT staff, which reflected positively on his teaching style and exam structure. For instance, a decision maker stated that, *"I changed from our traditional style that relied on memorization to more critical and analytical thinking, in this way the students were more engaged and excited about improving their problem-solving skills for the project management modules, specifically ERP projects" (N2).*

The same interviewee reflected that *"I started the project with academic experience and went out of the project with real practical experience, which means the process of implementing the new ERP reflected an important period in which I acquired further IT management skills. As my teaching experience differed after the application of SAP ERP, I tried to transfer this knowledge to my students by reformulating the materials and exam structure to assist them in using their critical thinking in any IT project management. Their attitudes in the lectures changed; they became more willing to attend and participate and became more active learners… And then many of the universities in the gulf region contacted me for ERP consultation. I was so happy and proud of being the first person in the region to handle SAP ERP" (N2-DM2).*

From this, it is clear that the decision maker was focused more on his own development and his future career rather than on the university requirements. This directly resulted from the policies and authorities that had been given to the top managers in a centralised decision making structure. Therefore, the evaluation of the obsolescence was unlikely to bring forward the right solution in the circumstances.

➢ *Decision-maker culture*

Alongside the above sub-category, from the data collection, it was perceived that the selection of the specific dynamic of decision making strategies were impacted on by different critical aspects presented as values and cultural expectations. These acted as guiding principles for ERP obsolescence. From the data collection, it was perceived that the selection of the specific dynamic of decision making strategies was not only dependent on the qualifications, abilities and motivations of decision makers, but was

also influenced by their values and cultural beliefs as guiding principles for dealing with problem perceptions. As mentioned in previous sections, decision maker's backgrounds and benefits and centralised decision making were the consequences of a decision maker culture of thinking and their ability to deal with the problems, as one IT manager stated: *"The individual differences between top managers and decision makers in the entire organization highly influenced the previous decision to make the ERP obsolete. For example, the way of planning, cultural beliefs and abilities to handle and solve decision problems brought conflicts between staff who were concerned that the lack of IT expertise in the region would affect the new implementation, while the decision makers thought about best practise."* (N13)

The findings of the interviews also support the idea that cultural differences between staff at the university influenced the decision-making process. This was exemplified in the work undertaken by M2, who stated that, at the university, the Egyptian workers' cultures differed from other workers in term of solving problems, due to the fact that they were keen to work in Saudi and so strove to achieve high standards to prove themselves, while they were also more flexible in their work and financial attitudes.

This point was also reinforced by an Egyptian IT worker who thought that coming from an Arab country gave him the ability to work and understand the role and regulations of Saudi government more than others workers:

"My opinion was to give us more time to build and develop our system that can meet the local needs and follow the government roles and restrictions, as these would not be clear enough for external contactors who handle the responsibilities of SAP. This gap would more likely fail the replacement of a new ERP system. Since each one had his own culture that affected their own problem-solving approach… is from the US, China, Egypt and Saudi. Are they the same? Of course not… There were many push factors towards the system they referred to as cultural influences. The university followed western cultural practices in terms of IS solutions." (N17)

In contrast, M9 mentioned that the culture of the local Saudi staff was different again, in terms of levels of work responsibility, due to their limited knowledge and training in using IT, therefore they tended to work with a flexible system that required less effort.

Moreover, as stated in the above section, the local decision makers who had qualifications from western countries had a different culture based on their background

and networking with other western professionals. By considering this element, the decision makers believed that applying international system with access to world-class capabilities and vendors would bring world-class resources with high quality and a competitive advantage, where these did not exist in-house. Therefore, the absence of both western international IT system and experts meant Saudi Arabia remained behind these international trends.

"I did not want to apply a system that was not famous internationally in the IT market, as the profit would be limited for me, for the university, and for other stakeholders. Thus, I couldn't build strong infrastructure because the university size expanded year by year, therefore we needed to develop our name in the market and create a good impression for the west that we are developed and implement the latest best practise in IT technology" (N2-DM2).

It appears from the above quotation that these different cultural beliefs influenced the ERP obsolescence.

> *Project manager changed regularly*

Frequent changes in project manager and decision maker teams resulted in ERP obsolescence. This refers to the policies applied by the university that the project managers needed to be re-elected every two years. The Director of Financial Application Management and administrative staff specified the implications of these substantial changes as being the enhanced ability of the project managers to apply a short-term system plan during their period in charge instead of a long-term plan, as discussed in Section (4.2.1.2). By aiming only for short-term accomplishments and results, they missed potential opportunities and neglected the future consequences of their decisions.

"The university changed the first project managers of the previous ERP and then employed DR.AR to continue to support the system. Certainly, once we heard that the contract of the project manager who was also responsible for the ERP implementation decision had ended, I was worried about the system, as Dr. WN supported us during his period of work in this position and he knew everything about the system, which the new manger knew nothing about. But as expected, the system was replaced by the new manager, but I was not satisfied with the new requirements. You know that this change of project managers increased the possibility of a short-term system plan." (N15-IT)

The findings also indicate that regular changes of project leader impacted negatively on the efficiency of the previous ERP system, which led to the ERP replacement decision, by having new ERP manager who did not have any idea and information about the previous system, as they had not been involved on the legacy ERP system decision and its implementation period.

"Actually, I was on study leave for four years I did not know any details about the previous ERP system I did not even contact the project teams." (N2-DM2)

Moreover, the university did not share their new decision with the previous project manager: *"I did not know about the SAP system as I was not involved in the selection process and I had not been asked for any analysis or experience of the previous system."* (N1-DM1)

Also, the IT manager highlighted that this lack of knowledge and understanding meant that the new managers were less interested in and less willing to try to recover and enhance the existing system:

"We met the new decision maker, who complained about a lack of clarity in some aspects of the previous system." (N16-IT)

As reported above, the university did not have any e-files or even paper documents on the historical background with which to update knowledge about the previous ERP system with the new project manager. This increased the new project manager's unwillingness to spend time on the system, as pointed out by an IT director:

"We do not have any reports or online files that can show the previous ERP status or even the implementation of the new one. There was a lack of transparency in the decisions and the system implementation process which meant that the new decision makers did not know much about the system, though all project managers have to be knowledgeable and have a clear understanding about the system. Therefore, they asked the new company to analyse the situation. This was one of the push factors that impacted on the replacement decision." (N3)

To summarise, it is noticeable that regular changes of decision makers negatively affected each part of the system, including the university, individuals and the overall performance. Any substantial changes of any part of the system will lead to regular ERP changes, such as changes in IS development and the university business process. ERP is an endless process that needs continuous monitoring and support. Organisational rules

can contribute to management obsolescence and thus obsolete the previous ERP system; but considering these obsolescence factors, their relationship and consequences by finding a proper solution to the issues can save a system's life.

> *Lack of communication between decision maker provider and decision maker*

Effective communication between diverse ERP stakeholders being one of the indicators of the success of an ERP system during its different stages, including pre-implementation, implementation, post-implementation and replacement decision. In the current university, there was a clear indicator that many ERP obsolescence issues were associated with poor communication between decision providers, represented by the Ministry of Higher Education and decision makers represented by the university.

"We did not share the decision between the internal bodies of the university who were responsible for making the decision and the external one who was responsible for giving the decision. It is right that we were forced to follow government decrees but those who imposed the decision did know about the available resources for operating the system, or how the entire functional and management tasks were managed. Simply, I can say the instructions were not well-studied; they just cared about following the trend and providing the budget to achieve this. Moreover, the internal decision makers did not consider the rules and regulations imposed by the university. For example, if you know that your government has strict rules about outsourcing IT staff and mangers, you rely on those people and exclude your local ones, which is not the aim of the Ministry of Higher Education, which wants to improve local people's skills to achieve global market competitiveness. This gap between the internal and external decision created many IT problems including wrong IT selection and the lack of a well- developed strategy for hiring foreign workers." (N15-IT)

According to this participant, the Ministry of Higher Education should have the conformations related to ERP requirements, and the university's entire process and the available resources that the university has also need to be monitored in terms of system development and its outcomes, rather than simply giving them the budget and pressurising them to follow the trend avoid any kind of system replacement effected by the lack of connections of internal and external bodies, which ultimately had a critical impact on the system. This lack of communications led to a lack of updated knowledge and understanding about the system requirements, which increased the possibility of

system problems. Therefore, the system needs a well-planned and shared strategy that includes internal and external roles.

➢ *High impact of internal competition between decision makers*

In addition to the above causes of ERP obsolescence at the university, highly negative competition was another sub-cause which emerged from the case study. According to the previous sections, centralised power and the freedom of authority for decision makers and project managers increased the internal destructive competition between different decision makers, who competed for positions of primacy.

"All the decision makers and project leaders just imposed new resolutions and increased the conflicts among the project team in the situation, and we were the victims of their competition." (N11-IT)

Therefore, the competitive climate was very intense, which increased the worries of some employee in terms of accepting the required tasks, as the entire IT team who worked with the previous system competed against the current system project team within the organization.

Furthermore, it was found that the direct and adverse effect stemming from the lack of encouragement in terms of positive inter-employee competition led to reduced team morale, and this in turn had a negative impact on team cohesiveness, the effectiveness of collaboration, and productiveness. Moreover, the competitiveness that was encouraged promoted distrust across the team, thereby leading to unhealthy rivalries and hostile relations, as supported by the HR manager:

"We were conflicted: who would follow which manger we were directed to? I was with the IT team, who worked closely with legacy ER., After I heard that we would have new project managers for current ERP system, there were uncertain conflict among different IT groups at the university. Each of those groups were following their director and if the other mangers asked for any assistance the director created a problem which I feel threatened those people, as they competed against each other. Therefore, we were excluded from the SAP ERP system decision, which affected our effort and increased the worries in such negative environment! I was thinking of leaving the job if I had another choice to work, as many of my colleagues did. Our productivity reduced and the majority of employees were angry about the lack of trust and how they did not even value our roles." (N9)

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Another participant stated that there was a loss of cooperative group working in the entire university, as each one of the powers of attorney had several targets instead of one objective, as successful ERP system required.

"There was competition, as profit for the individual was above the team working benefits,. Since they though in this way, the ERP would continue to be replaced for the benefit of the individual." (N17-IT)

As reflected above, the internally conflicted environment based on negative competition led to unwise decisions as a result of individual decisions, in preference to enhancing the collective decision toward applying a new system that distinguished the decision maker from others. Therefore, many professionals quit working at this university because of the pressure put on them. As a result, the productivity of the individual workers decreased and discontinued support for the system negatively impacted on ERP productivity and performance. This not only shows how this factor impacted on the management side but also how it influenced human resources skills and the ability to work. Consequently, this affected the ERP system and made it obsolete.

➢ *Lack of ERP vision*

One of the issued that emerged in relation to the ERP plan was unclear ERP maintenance direction, as confirmed by many employees. For instance, the IT director said, *"Basically we did not have any glow about ERP plans and its further maintenance details as the application of the system was random and developed with few number of ERP staff. We were not aware when or how frequently the redundant data need to be clean as Dr. MQ dealt with IT expert without giving us a clear explanation for issues that we might face during the system go-live phase and what the plan was for these issues and other alternative solutions." (N3)*

Another participant stated *"In fact, the previous ERP was randomly applied, no clear transition where to go next, and more system details were hidden" (N1-DM1).*

As result of this unclear plan and directions, further system development was difficult to apply, which led to ERP obsolescence.

"This lack of project schedule led to non-updated real time activity and progress, which did not develop the plan carefully, just going to a short system life plan which thus paid insufficient attention to system details and staff were careless about completing such a

task. All these were obvious obstacle to continence of the previous ERP, therefore the new manger asked for a new system with a proper plan." (N6-M)

This section shows how these factors were interrelated and closely related to external factors in a number of ways. The following section will discuss the external influence that played a part in the ERP obsolescence decision.

4.3   External Environmental Obsolescence (EEO)

Internal environmental factors have been shown to be related to external environmental factors and this is also the case vice versa. This section will present a detail account of EEO factors that refer to factors caused by the external environment obsolescence of companies, which impacted on the previous ERP to be obsolete and no longer desired at the university under investigation. These external factors included:

- Policies and Restrictions obsolescence (4.3.1);
- Competition by Other HEs obsolescence (4.3.2) and
- The Local IT Market obsolescence (4.4.3)

Just as the internal factors were set out one by one, for the sake of clarity the same practise is applied here in relation to external obsolescence types. Nevertheless, it is important to initiate that, in reality theses external types are also interrelated closely followed since the wider economy and environmental is as dynamic as the internal one. The figure below (4.11) illustrates the whole picture of emerging EEO factors from the research findings.
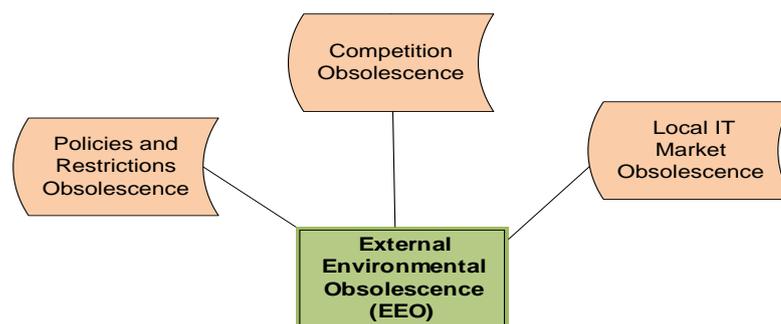
Figure 4.11: The main External environmental category

4.3.1   Policies and restriction obsolescence

As emerged from the case study, this is referring to new rules/policies and changes imposed by the Saudi government. These new rules caused the obsolescence of

previous ERP at the university. This category saturated into three sub-categories, mainly,

- Governmental Policies Issues (4.3.1.1);
- Economic Issues (4.31.2); and
- Educational Issues (4.3.1.3), as shows in figure 4.12 below
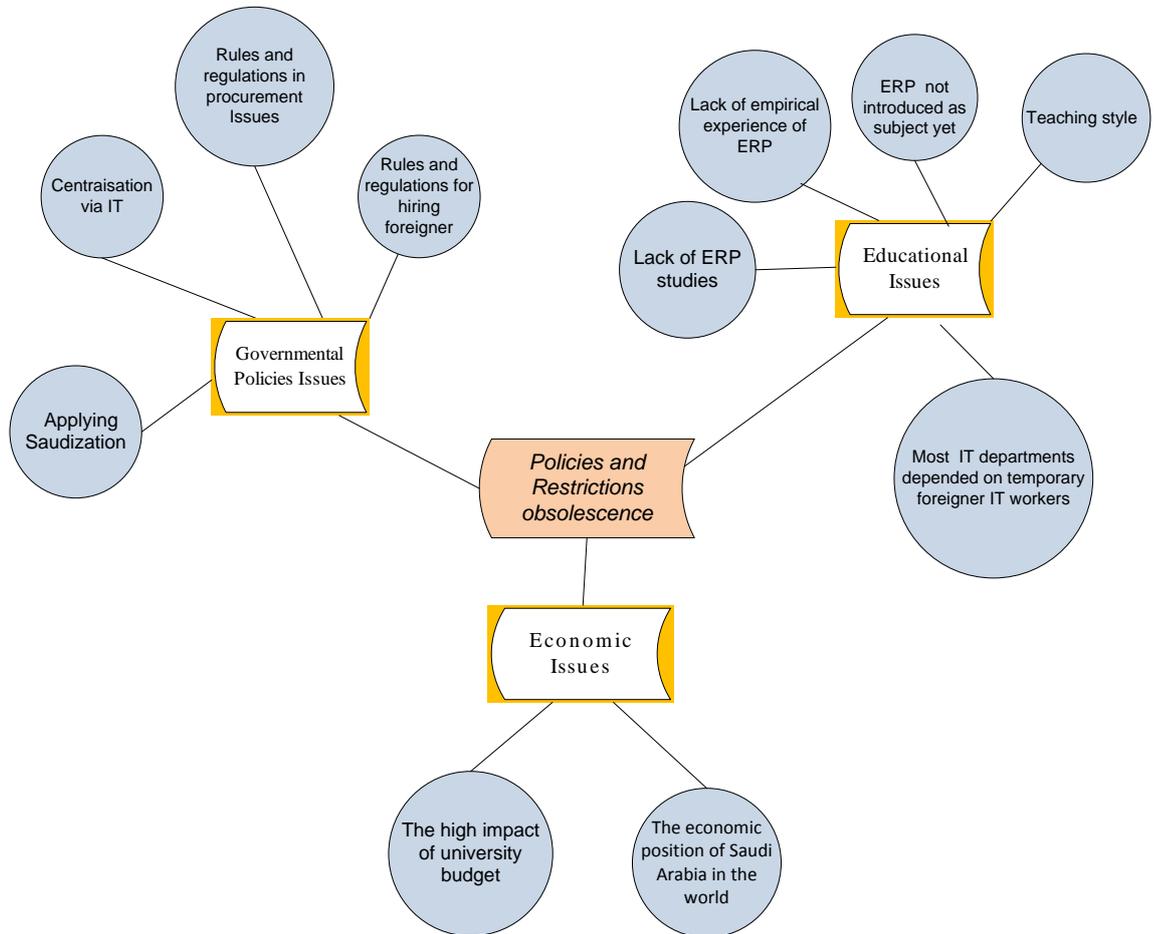
Figure 4.12: Concept map of policies and restriction obsolescence

4.3.1.1 Governmental Policy Issues

This sub-category illustrates how the different governmental directives affected ERP obsolescence. These policies can be put into four different sub-categories, which include:

➢ Rules and regulations for hiring foreigner;
➢ Rules and regulations in procurement issues;
➢ Centralisation via IT;

➢ Applying Saudisation, as shows in Figure 4.13 below
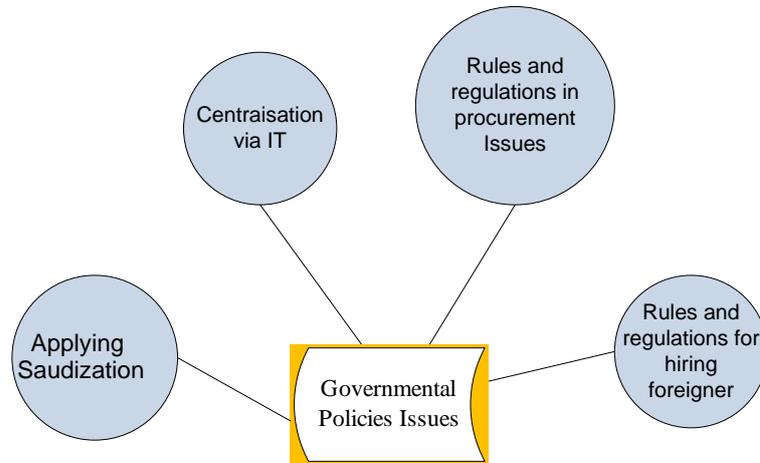
Figure 4.13: Sub-sub category of policies and restriction obsolescence

The next section will go through each one in more detail.

➢ *Rules and regulations for hiring foreign workers*

Due to the fact that the number of foreigner workers in Saudi has increased gradually, the Saudi government decided to impose new policies related to those foreigners in different sectors across the country. One of these rules concerns their visa issues for entering the country and vacations. Applying these rules took between two or three months, due to the need for agreement from different governmental departments. This time consideration led to a delay in passing those foreigners and therefore delayed the work, causing frustration and worry, as one decision maker said:

"Well, our government change our work conditions regularly by imposing new complicated rules, one of which related to contracting foreigners and outsourcing workers, limiting the contract to no more than two years; with the need to go through a complicated process again at this point. These rules led to delays in workers' arrivals, so we had to contract with another third-party IT company. This caused a lot of problems which in the end meant that we decided to replace the system and contract with new ERP vendor to assist and handle the university] system and provide well-skilled IT specialists." (N1)

Another example was provided by IT manager:

"We are not like private insinuations, whose process is much easier than ours in terms of hiring foreign staff, for the university is too multifaceted and it take a while for plans to be agreed. Actually, these rules not only impacted on system development but also on own lives and future careers, therefore, contracting with a private organisation was much better for me." (N13)

As stated in Section 4.2.2.5, the majority of IT tasks at the university were run by those foreign workers. In other words, the high reliance on qualified non-national IT experts meant the system could not be operated without them. A consequences of hiring different IT experts from a different vendor was that the system was put at risk again and increased the complexity of the situation, which led to ERP obsolescence, as shown in section 4.2.3.1.

➤ *Rules and regulations in procurement issues*

It was perceived that, when dealing with public organizations, such as the university under study, there were many legalities and regulations related to the procurement system which needed to be followed in order to achieve the required task. This increased the complexity of the process by requiring different ministries to get permission and approval for the required tasks and materials to be achieved. Since the university is a governmental institution it is impacted on by the regular changes made by the governments and this led to the change of its system. For instance, an IT programmer and analyst stated*: "The regular changes affected our previous ERP system, as a result of the updating, further modifications for maintenance were required. Due to the inflexibility of the previous ERP system, the university faced difficulties in applying these changes. Because of a lack of professional knowledge, some just left the job and the replacement was not familiar with Saudi policies." (N14)*

A decision maker gave another example: *"Actually, a public university differs from a private university, where everything is calculated. For example, the warehouse system here is different from other warehouses, such as the UK system. At the university, we have a warehouse management system which is connected to all departments at the university and its branches separately, and any procurement, such as networks, laptops, PCs, building new labs and new equipment all go through complicated processes, due to the new public and governmental regulations." (N2)*

From another point of view, an IT manager said that, *"As a large university, the purchase system is considered to be large, and is used not only to purchase devices for one department but for the entire university system, and we have more than 120 administrator's directions... Here we differentiate between buying from your own pocket and buying from the university budget. The university needs to go through different governmental units inside and outside the university and the changes in government policies required change at the university system and required further maintenance, which was not available at the university; therefore, in order to have a reliable system with enough IT experts that can manage these changes effectively, the universities bodies asked for a replacement."* (N13)

From the above contributions, it can be concluded that there was an obvious issue related to procurement policies at this public university. The policies were changed very regularly and led to difficulties in modifying the previous ERP system and difficulties for staff, as they had limited IT skills when it came to adjusting the system in order that it aligned to the new governmental instructions. They emphasised that the key decision makers at different internal and external levels at the university made the decision without connecting with each other, in term of discussing the possible outcomes. There was also a lack of consideration of the system's inflexibility in terms of just imposing a rule.

➢ *Applying Saudisation*

One external sub-category that emerged from the data analysis was applying Saudisation, which refers to an official national policy of the Kingdom of Saudi Arabia involving the replacement of foreign workers with Saudi nationals in both private and public sectors. The IT director clarified that *"The percentage of foreign workers in Saudi Arabia has reduced, as the government has imposed new restrictions on the recruitment of such staff, reserving certain jobs to Saudis. No more than a designated number of foreign workers can be employed at the university and this percentage was determined by the government, so there were a lot of pressures on the university to reduce the number of foreigner employees."* (N3)

Similarly, decision makers stated that *"Within the governmental sectors, especially universities, the application of a Saudisation strategy was made, with foreign workers capped at 20% of the workforce, as imposed by the government. However, there were roughly 90 percent of non-Saudi workers in the private sector, such as in IT companies*

and other suppliers, as the private sector can have more foreigners than the public sector, therefore we had difficulties recruiting specialised ERP staff, as most desired to work in private companies, as the allowance percentage was higher. However, after the national plan of Saudisation, the availability of suitable vendor staff and ERP experts was effectively reduced." (N2)

The staff director pointed out that *"Our vendor was compelled to close and withdraw from the market due to this new Saudisation policy, as most of their employees are foreigners, and this placed unfair regulations on us and them to hire more expensive local employees who did not have knowledge of the relevant information technology." (N10)*

On similar lines, an IT staff member explained that "*Despite the fact that the government considered Saudisation to be a neat solution to unemployment, the university and other IT companies that we worked with complained about this action, as the native Saudis were unwilling to take service jobs and unable to take skilled technical jobs, for which they were not educated. As you know, the nature of the education system is theoretical not practical. From my perspective, this Saudisation increased the risk of ERP failure and replacement at the university and other organisations due to the replacement of qualified and expert staff with staff who had no job knowledge and expertise, and this led to "putting the wrong person in the wrong position", and thus to ERP obsolescence." (N17).*

The above quotation clearly indicates that is was not only the functional side of the previous ERP system which led to ERP obsolescence but also that changes in governmental rules had consequent effects, which threatened the success of the ERP system. Most IT projects in Saudi Arabia are run by foreigners, so applying such Saudisation rules reduced the number of qualified workers, thus pressurising existing workers, as the university was unable to employ more labour. In addition, the lack of qualified native Saudi staff in the Saudi market impacted on system enhancement and development, as mentioned previously in Section 4.2.2.5, due to the heavy reliance on non-Saudi labour at the university. Therefore, the changes in governmental rules required well-considered regulations that matched the available resources and the environment in order to avoid the gap between each area. The change of any information system might lead to a regular change of the ERP system in both public and private organizations, thus affecting the university and workplace environment.

> *Centralisation via IT*

Another restriction emerged that had a role in the ERP obsolescence, as raised by different managers and IT staff. The Saudi government had new goals in their fifth development plan for a centralised e-government which integrated diverse governmental institutions with the aim of them becoming paperless.

"The government required the integration between its different public institutions and different ministries in the region… and all related organisations that provided a service for our university, instead of using the traditional way and the minimum integration as before, therefore, top managers and decision makers decided to replace the previous ERP." (N5-M)

"Basically, in order to apply the governmental plan of connecting the university with other organisation, a fully integrated system we essentially needed as a solid ERP system, such SAP, as this is well known to have these characteristics. Thus, replacements were required instead of modifying the existing system." (N2-DM2)

Thus, centralisation, as a new governmental plan, required strong integration to achieve a high-quality service for different external stakeholders in order to save time and provide the best service. As the previous system did not have the flexibility to build a solid integration among diverse' governmental insinuations that might have the new ERP, this regulation is considered to have been another push factor towards the obsolescence decision at the university.

4.3.1.2 Educational obsolescence

The outdated educational system impacted on the human resource availability and the use of the ERP system, therefore it was vital to consider the underlying causes, not simply to replace the system.

This section discusses the sub-category, Educational obsolescence (see Figure 4.14), and presents sub-sub-subcategories related to this category, as follows:

> Lack of awareness of the use of information systems;
> Lack of empirical experience of ERP;
> Lack of ERP studies and awareness;
> ERP not introduced as a subject in HE;
> Restricting IT training courses to professional foreigner;
> Most IT occupations /jobs depending on temporary foreigner IT workers; and

➢ Teaching style
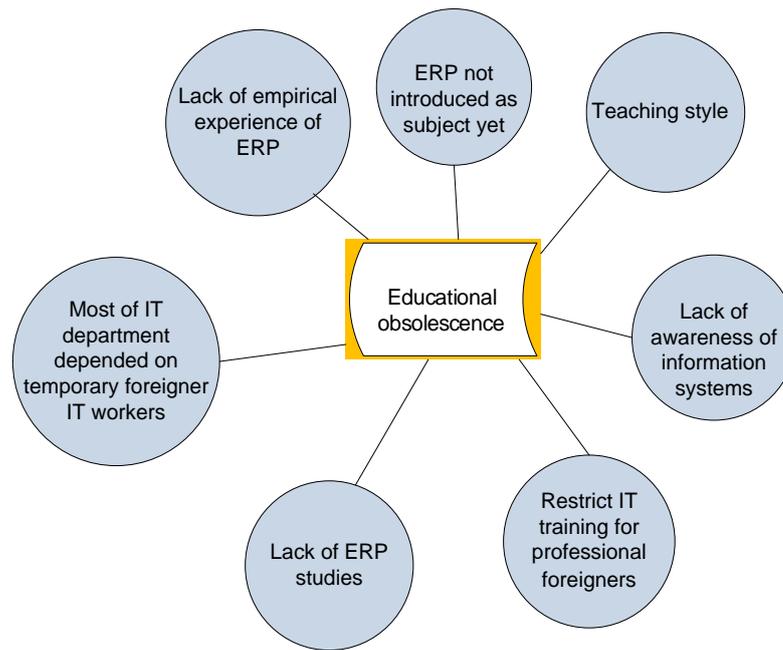
Figure 4.14: Concept map for educational obsolescence

➢ *Lack of awareness of use of information systems*

Many interviewees claimed that, in Saudi universities, there was very limited IS learning and practice available for students, such as a decision maker, also a lecturer, who said:

"*In terms of teaching, there is a lack of attention to IS development studies' advanced components, including software, hardware, databases and networks. Also, related equipment is out of date as well as the content about these components. For example, using the old programming languages for module content without much depth (very basic theories) did not match the new technology market. Therefore, students cannot work and deal with the advanced technologies, such as ERP. So, if we have better qualified students then they would be well-qualified workers in the future.*" (N1)

Another participant stated that:

"*Information system education and modules are involved in all Bachelor's, Master's, and Doctorate levels studies. IS education begins with Bachelor studies; the information system subject was combined with computer science studies, and more recently universities have started to separate computer science and information*

systems. Despite this separation, only a few modules are different. The first stage is the general foundation modules. Usually in the first year, students need to take modules like chemistry, physics, religion, English and biology. In the second year, they need to learn the computer foundations, such as object- oriented languages. In the third and fourth years, students learn more about databases and develop a general understanding of information system definitions with general thoughts and theories. They must also complete a thesis to show their in-depth knowledge of information systems. Therefore, Saudi workers would always worry and are less motivated to practise technology due to these complicated systems and contexts." (N11-IT)

"We have a limited number of universities that provide information system studies and the branches of the IS field come under Computer Studies or Administration and Economic Studies, which do not offer in-depth knowledge about information system projects or consider IS modules in detail. Therefore, we call for the restructuring of the educational system of Information Technology Studies, which in turn would assist in improving our thinking and awareness about this particular and important field, and avoid all related issues that could impact on IS practise." (N9-M)

As shown above, students on IS programmes could not gain a good understanding of IS/ERP, either in theory and in practice. However, as also shown, IS education includes very limited teaching, training and practice at university level, which continues to impact on any IS system. As confirmed by interviewees, the basic problem for this kind of ERP obsolescence is the absence of this type of educational activity, which means relying on outdated skills and knowledge about this area and makes the local student obsolete as a future worker. Therefore, the university and the government should understand the root definition of IS/ERP obsolescence. In addition, they should consider that the ERP system is not just software but a learning process that requires an understanding all the factors that can a play a role in the success of the system and the relationships between its factors to insure the long-term success.

➢ *Lack of empirical experience*

As previously mentioned in Section 4.2.3, there was a lack of national experience with ERP. However, this shows that the appearance of this sub-category in both the internal and external categories highlights the importance of both decision makers (internal and external) restructuring their understanding of the lack of empirical experience for Saudi staff, which reinforces the continued overdependence on foreign ERP specialists.

➢ *Lack of ERP studies and awareness*

Most interviews demonstrated ignorance and a lack of awareness associated with ERP as a system, due to the absence of ERP studies and its limitations in the Arab region in general and the Saudi context more specifically. The IT director mentioned that this resulted from the lack of promotion of the importance of updating information systems and ERP studies.

"The lack of awareness the ERP system in our context created a lot of issues that impacted on the successful use of the university systems. From my perspective, there is a lack of interest and awareness for evaluating ERP studies in both private and public organisations and for codifying the outcomes of this system to gain as much benefit as possible in order to improve and enhance our understanding of the complicity of the system is essential." (N3)

Another example was given by a decision maker, who stated: *"Overwhelmingly, despite the fact that many had implemented ERP systems in different Saudi sectors, organisations did not share their experience and information with others, as they usually tended to keep their information and thus a lack of clarity around ERP situations and studies developed…. It is important for our government's policies to enhance and encourage the idea of recording more studies in Information system applications studies to learn from their mistakes and avoid future circumstances that might mean replacing systems due to unfamiliarity with the system and its important components." (N1)*

Both these contributions indicate that there is strong evidence for the lack of ERP research and documentation on the use of ERP in Saudi organisations. This has contributed to ERP obsolescence. As stated in Section 4.2.4, the staff were unwilling or unmotivated to keep or share their experiences, even internally, as this was not advised or guided by the internal and external environment; nor were ERP and information systems users informed about the importance of documenting the successes, failures and difficulties of the system, and more importantly of ERP areas. Thus, the lack of ERP studies impacted on staff skills (managers, decision makers and IT staff) and organisational cultures towards understanding the challenge of ERP systems, and the KSA will always be behind other countries in terms of using IS, as they were not up to date with the current situation of IS, which led them to change their system without understanding the reason behind it.

➤ *ERP yet to be introduced as a subject*

This sub-category emerged as an underlying cause, as the ERP system has not been categorised as a module or subject at Saudi universities, as explained below.

"As we all know, university and other educational institutions are where people across the world go to establish their understanding and knowledge of different areas, and issues related to our world is an important part of development Therefore, to start to develop the organisation, we need to rethink the basic reasons for it or scratch the IS development, in order to build a solid background and knowledge from where the workers gain their education about specific subjects, such as IS/ERP. What happens in the current university situation is the opposite, where there is no specific major about the ERP system; very few Saudi universities offer this, and, where they do, there is little sense of the practical side, including technical and managerial sides of the system..." (N9-M)

"Basically, we have lost the consideration of ERP as a subject and I think this is the most important component that needs to be considered, not only theoretically but practically as well…… for instance, to move from paper exams to a practical project assignment with a company. The students and those who will become workers in the filed must place themselves and their skills in the current market place. By this we can avoid and decrease the overall dependency on foreign specialised." (N5-M)

The employees' thoughts about their ERP obsolescence and ERP problems here relate to the most critical underlying causes associated with the lack of considerations of ERP as a subject or module at university. Considering this as an essential subject is essential, if the government wants to avoid over-dependence on foreign ERP experts.

➤ *Restricting IT training courses for foreign professionals*

This cause has been explained before in Section 4.2.1.4; the reason that it has appears here again refers to the same strategy or policy of exclusion of Saudi staff from training courses, which has been used and applied by both decision makers internally (from university) and externally (represented by the Ministry of Higher Education), and the data indicates this has influenced ERP system obsolescence, as supported by a decision maker:

"Local staff were not able to share their critical thinking or practice their analysis, nor were they able to be involved in any kind of IT project assessment and activity that required IT analysers, developers and programmers." (N2)

Similarly, an IT manager emphasised that *"The university were not able to rely on their Saudi employees who had not undertaken any kind of experience or course, so some university policies played a role in that sense" (N13).*

➤ *Most IT courses depended on temporary foreign workers*

Most IS and computer science modules or subjects were taught by foreigners, either as academic or technical staff. Thus, the Saudis lost the opportunity to occupy these core positions to gain knowledge and practise.

"How can we develop our skills and knowledge, to be more aware about the subject, if most of the key roles (academic, management and technical) are held by foreigners who will not be here forever?" (N7-M)

Staff stated their annoyance at the employment of foreigners for the most critical positions at universities, and that ERP obsolescence would continue, as one day universities will not be able to find such staff and the Saudi staff will not be educated in term of IS/ERP issues.

"Foreigners have the expertise that locals do not, but if we have foreigners in academic jobs and technical careers, how will we deal with ERP as a complicated system? Student who graduate from IS subjects will be refused such positions, and so in their future career they will not be able to deal with information systems, and more specifically ERP systems "(N8-SD)

➤ *Teaching style*

Teaching style refers to the way a particular teaching method can influence the development of the student as a future worker. As mentioned by some interviewed professionals, the current structure of Saudi education still works in traditional way, despite the fact that the use of technology in different sectors across the country has increased in the last few years. However, the Ministry of Higher Education, instead of improving on this outdated approach, sought external qualified staff with the required skills in line with the trend.

"In Saudi, there is a lack of quality in education, given the information technology developments; I was teaching computer science, and the content was still in the legacy language, such as C, and the information system modules were still very basic. I mean here there is a mismatch between the marketplace requirements and the education direction and its content: for instance, ERP as a software system and information systems are not taught at any education level." (N10-D)

"All we know is that the educational system is the output of the development and innovations of the HIS future, but unfortunately, most academic modules depend on the Ministry of Higher Education to prove and provide the education content for different education levels. Therefore, we find that few staff who can understand or are qualified to deal with these complicated systems like ERP; thus, we find qualified external staff." (N1-DM1)

More specifically, an academic staff member and decision maker, stated that *"With the SAP ERP experience I changed from our traditional style that relied on memorization to a more critical and analytical approach. In this way, the students were more engaged and excited to improve their problem-solving skills for the project management modules, specifically ERP projects" (N1-DM2).*

The above quotation illustrates the importance of improving teaching style, in which the student who will be a worker in any sector in Saudi Arabia has to improve their critical thinking and problem solving,

The decision maker confirmed this view: *"I started the project with academic experience and went out of the project with real practical experience, which means the process of implementing the new ERP reflected an important period in which I acquired further IT management skills. As my teaching experience differed after the application of SAP ERP, I tried to transfer this knowledge to my students by reformulating the materials and exam structure to assist them in using their critical thinking in any IT project management. Their attitudes in the lectures changed; they became more willing to attend and participate and became more active learners." (N2-DM2)*

As you can see from above quotation, if staff do not have problem-solving skills this will make the system obsolete due to a lack of critical thinking capabilities. Therefore, the teaching style should be up to date with advanced technology, producing people with critical thinking skills for the continued support of the system.

Consequently, staff at the university might often fail to think and analysis critically due to a lack of experience resulting from the teaching or education style. The ERP tasks and decisions cannot be conducted by following an appropriate or right method. Thus, the decision makers leave these issues to external conductors.

A decision maker exemplified this: *"I do not need to think too much about the ERP problem and its situation; I just prefer to leave all the issues to the vendor to sort out."* (N1)

Another example given by an IT staff member was that *"Managers did not always give me and my colleague the chance to think about and analyse a problem as they prefer to ask foreign staff rather than hear my thoughts, so I do not feel interesting in working at the university"* (N17-IT)

The above arguments show that the ERP obsolescence process is not just a decision but a learning process where underlying factors play a significant part not only in the staff skills obsolescence but also in system and organisational obsolescence, thus affecting organisational performance.

4.3.1.3 Economic Influence

The ERP obsolescence decision processes revealed an economic influence as another external factor. Decisions were impacted on by the economic position and conditions of Saudi Arabia, which has a significant role in increasing the university budget available for such obsolescence, and also involves the economic benefits of applying the latest IT technology to increase economic efficiency.

➤ *Economic position of Saudi Arabia in world*

As discussed earlier in the LR, the Saudi economic context is dominated by oil reserves and is the second largest *"leading exporter and producer"* (N1-DM1) in the world. By having such high economic efficiency, the government been able to provide millions to improve many different sectors across the country. HE is one of these sectors; the government divides the budget available among the universities, based on size and position. The university under study, one of the leading universities in the region, receives a large budget. Considering this advantage, the management decided to obsolete the system instead of deploying the money for maintenance purposes.

 "We all know that the Saudi position gives us financial resources, as we live in the second largest leading exporter and producer and the leading university in the region,

and that the government provides an appropriate budget for IT projects. Therefore, in term of financial problems, we did not suffer from them, as it was available for the whole project, so it was better for us to employ this amount on a new project to tackle all the maintenance problems." (N1-DM1)

An IT staff member argued that "*the problems were not a matter of a lack of funding; but of the lack of a good management plan." (N17)*

These contributions make it clear that, despite many IT projects' main problems being related to a lack of financial funds to further maintain the system, the university under study did not have such problems. The availability of budget was considered to be a perfect sign to continue the success of the IT project, but without having a proper management plan, it would be used in unrequired obsolescence and in incorrect ways, including a lack of definition of the conditions and roles required on the IT project at the university, and giving authorisation to the wrong people. However, this shows the interrelated factors and the complicity of the situation in which the internal factors are related to the external ones, and vice versa.

➢ *Economic efficiency of existing system*

As discussed in Section 4.2.1.2, the motivation for having a new system was economic, as the system which existed at the time provided accessibility to world class skills and resources to meet the needs of the university and its users, where these skills did not exist in-house. In principle, ERP can provide access to "best in the world" quality and create competitive advantage. Then the university would be able to specialise in particular SAP ERP services, thus creating a relatively large business volume which allows the university, and specifically the IT department, to take advantage of scale economies and consequently to operate and maintain the services more cost-effectively.

"*Changing to SAP ERP was economic vision, from my perspective. Applying SAP is considered to be a high return investment. You know that the previous system became an outdated technology in the region, as many public organisations in the region did not want to continue with this previous system, as most of them followed our steps and sought to have our consultation in system development based on our experience with different systems. Therefore, we need to think about making an in-house IT agency at the university that provides an SAP service and is exposed to other partners as another*

business investment at the university; as if we stay in the previous system we will lose this business position as it was not famous as an SAP system. And do not forget that we would be the first university in the Arab region to implement that which would increase economic efficiency and gain more from it." (N2-DM2)

Another participant emphasised that obsolescence occurred due to the demands of the previous ERP and its resources, including the fact that IT staff skills became outdated and the university considered it uneconomical to continue with the previous system that had a small market and low volume.

"It was not about the SAP as a system only but also about the high-class capabilities that it would bring to the operating system, as another investment for the university. These capabilities were not available in local universities or for the university employee skills either; therefore, it could produce "best in the world" quality, be competitive and provide different training courses for their partners." (N7-M)

From another IT perspective, this participant argued that the absence of fully developed monitoring meant that the quality may not be sufficient, therefore the investment was not worth it and failed to create business benefit and then became obsolete again.

"It was a matter of a lack of monitoring of the system by the project leader, I knew that the system had an economic attraction and benefits but this never occurred due to poor management and over-dependency on the outsourcing of staff, as happened before with the previous one." (N11-IT)

The above quotation supports the alignment of the organizational components and system requirements, involving interrelationships between multifactorial interactions, so that the external influences will directly affect the internal ones, and the system cannot work as a stand-alone system without other surrounding conditions. In other words, considering the external and internal influences is critical, therefore microscoping all the organization's parts and governmental policy factors of obsolescence and its causes is extremely important to save the implementation of the current ERP system.

4.3.2 Local IT Market Obsolescence

In addition to governmental policy issues, the category of local IT market Obsolescence also appeared as another external category in this research, which refer to the new things or changes that happened in the market that led to changes in the market trend

thus impacted on the previous ERP and contributed to its obsolescence. This category is divided into three sub-categories, as illustrated in Figure 4.15.
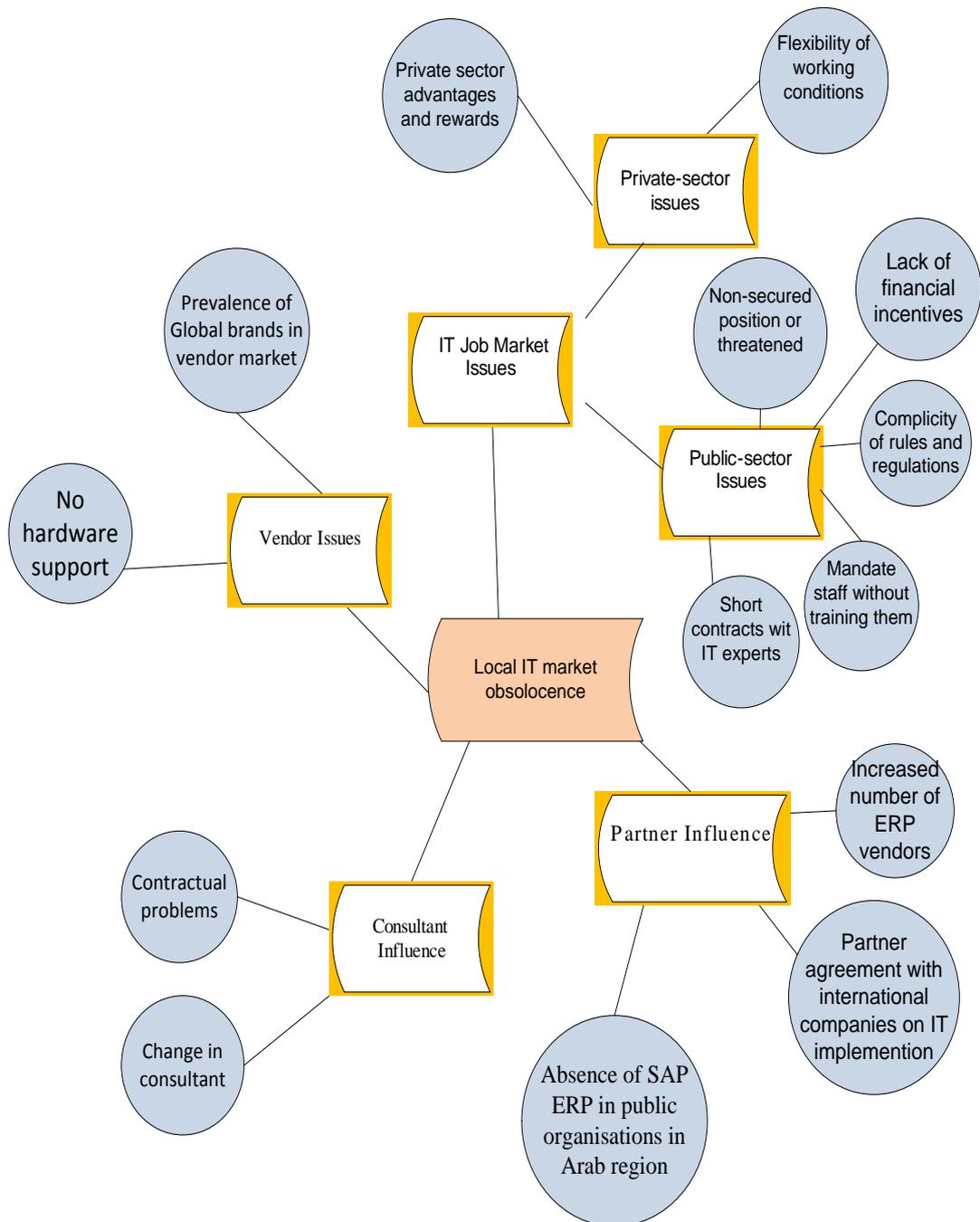
Figure 4.15: Concept map of local IT market obsolescence

4.3.2.1 Vendor Issues

Vendor issues refer to all issues related to available system equipment and services provided by both software and hardware suppliers (vendors). These impacted on the previous ERP and caused its obsolescence. By analysing the data, this sub-category

gave rise to 2 sub-sub categories which were identified as follows: hardware obsolescence and the prevalence of global brands in the vendor market.

➢ *No hardware support*

We all know that, as technology becomes outdated, integration becomes difficult and can result in a loss of strategic advantages. At the university, the previous ERP server was unable to provide a dedicated hosting of ERP applications and their data. This was due to a lack of supplier support as the server had been withdrawn from the vendor's market, which meant that the vendor could not provide continued support for the university server. Therefore, the newly available hardware made the previous hardware obsolete thus making the previous ERP system obsolete, due to a mismatch between the new hardware and the old system. This gave rise to the need for a replacement, as mentioned by a decision maker:

"We are looking for supplier support for server upgrading and increasing its size, but the current supplier has discontinued the old server equipment and is unwilling to provide this service. Therefore, the university does not currently have sufficient technical support from the vendor, so the option of upgrading to a new SAP ERP supported server with market-leading software would provide a great advantage for the university." (N1)

Another technical perspective clarified that it was not only the previous server which impacted on ERP performance but also the current university requirements, which had increased as the university had increased in size, with the addition of more departments requiring new software and hardware to be compatible.

"The hardware was unreliable and became out of date in terms of its compatibility with the server hosting the previous ERP applications, resulting in many difficulties with the old one as the university IT requirements increased and the old hardware became incompatible with new business processes." (N13)

It can be seen from the above that problems such as unavailability of support for hardware directly affected the whole previous system at the university, which led to the obsolescence of not only the hardware but also the software.

➢ *Prevalence of global brands in vendor market*

The spread of foreign ERP systems, such as SAP and Oracle, and others in the Arab region, including Saudi Arabia, has increased the pressure in Saudi organisations to implement global ERP systems with a global IT sourcing company in order to reach the required standards of top universities in the world.

"The university has been pressured by global SAP ERP vendors, as we are keen to increase our reputation and transfer from an in-house developed ERP systems to another, in spite of the previous ERP system being developed. SAP is a world class vendor and I think it is time to be one of the SAP alliance members in the middle east, and globally." (N3-D)

In addition, an HR manager argued that *"You simply cannot succeed if you are falling behind the competition in market technology advances, such as SAP ERP and industry and business sector standards." (N9)*

Thus, we can say that the emergence of the global ERP market in the region had a significant influence on the ERP obsolescence decision.

4.3.2.2 Consultant issues

Consultant issues emerged as another external sub-category that led to ERP obsolescence in the research under study, occurring when the previous consultant of the previous ERP no longer provided their expertise and advice to the university, as withdrew from the market, and it also refers to dissatisfaction with the previous agreement between the university and the consultant. This is discussed in more detail in the following sections.

➢ *Change in consultant*

Two reasons were cited by numerous interviewees for a change of consultant. The first involved the consultant being acquired by other universities and then becoming unwilling to provide continuing support for the previous ERP system: *"Our consultant had an agreement with different organisations, and so could not give us enough support and regular monitoring." (N10-D)*

The second reason involved dissatisfaction with the service provided, as stated by a decision maker:

"Our university agreed to take on a new consultant but they did not have the required knowledge and expertise that we needed for our previous ERP, therefore we decided to

cancel the contract and acquire another… The new consultant suggested that the implementation of a new ERP system was required in order to achieve all the university targets, and as the previous ERP system was not known about, due to a lack of documentation, and recorded information about system improvement and updates, the consultant thought it inadequate. Consequently, the change was made to our account and we opted for it instead of taking the time to look for the best consultant who could provide a service that might be a match with the previous situation." (N2)

➢ *Contractual problems*

Contractual problems with the consultant is another sub-category that appeared from the data analysis, referring to the situation of the shutdown of the consultant company as a result of the rule of Saudisation, imposed by the government, as most of the company's consultant workers were foreign. This had an impact on system support, which led to ERP replacement, as stated by the IT director:

"After the government applied Saudisation, we found a serious problem with the consultant company as the consultant said their previous employer would lose their job as result of this governmental decree. Therefore, the consultancy shutdowns from the market, as the only available ERP members were Saudi workers who didn't have the required standards of an ERP specialism, and due to the high salary cost, which had an impact on its business due to the university withdrawing its support because of a lack of expertise." (N3)

Similarly, IT staff indicated that, due to the high competition involved in contracting a qualified ERP consultant, the university suffered considerably with their consultant experiences due to pressure from the competition, who offered the consultancy more benefits. Therefore, the consultant was unwilling to continue its work with the university.

"Specifically, in the Saudi market, we faced a really hard experience with diverse consultants, as we always had external competition, as with any other organisation. These competitors, such as Umami University, tried to make it more advantageous for the consultant to work for them. After a few months, the consultant did not reply and no longer desired to provide such a service, so we had to change to the new one." (N13-IT)

From anther management perspective, it was pointed out that the consultant had the authority to withdraw from the agreement, as there was a lack of conditions and penalties for those who did not commit to the contract agreement.

"The problem lies where the clause does not represent a genuine ... contract, in which case it will be deemed to be a penalty clause and be unenforceable, leaving the consultant the choice to terminate the support at any time... and it was not agreed that, if they failed to do so a larger sum should be paid, as a penalty. However, this is out of our control and the absence of an imposed legal condition from both the university and the government led to a consultant contractual policy in order to avoid such a case." *(N2-DM2)*

As reflected in these comments, there was a lack of conditions and penalties for those who did not commit to the contract agreement, which is considered as a fundamental obsolescence factor that contributed to ERP obsolescence. However, this section has shown that consultant obsolescence occurs not only in relation to governmental policies but also to organisational rules, since the absence of a clear organisation conditions in term of dealing with a consultancy led to consultant obsolescence, and thus to making the previous ERP system obsolete. This also indicates the importance of understanding the influence of the relationship between factors internally and externally.

➢ *Partner Influence*

As asserted by many interview participants from both management and IT departments, there have been several instances of partner competitors using the latest technology in their organisations. These elements caused concern that the university would lose its status as a leading university. Therefore, the university made the obsolescence decision in order to remain as a leader and align with its competitors. The next section discusses these elements, and quotations are provided.

➢ *Partner agreement with international companies in IT implementation*

"After the importance of IT use increased in Saudi Arabia, we found that many of our partners made an agreement with many global IT companies for their ERP system support and implementation, so we basically raised this in our new strategy and planned to be a member of a SAP alliance to compete with our partners and remain in the leading position. By having the previous ERP system, which was implemented and developed separately, the university was threatened, considering this to be a real

challenge to reach the market standard. After an analysis of the ERP market in the region we found that no SAP system had been implemented in the public sector, so we decided to turn the existing system off to be in the line with the partner in the use of the latest technology, such as SAP." (N2-DM2)

A financial manager likewise pointed out that:

"Having ERP SAP offers a great opportunity to the university to be well known internationally. As many ministries and public sectors have implemented ERP, they have updated their ERP systems with many features, and having qualified staff with access to updated information, we see many of the names of those organisations and their achievements in the media. As a leading university, I think that implanting one of the leading ERP vendors will be the best solution." (N4)

Both of the above contributions illustrate the importance of the agreement among organisations and international IT companies, rather than local IT companies, as Saudi culture values international companies and trusts them. Due to the increasing number of companies who have already contracted with these international ones, this would have an impact on the university's position, from their perspective. Therefore, to be in line with such companies, the university authorities decided to make the system obsolete.

"The West used the technology previously so it is better known by them. Therefore, if any Saudi or other Gulf region organisation had such an agreement with these international companies, they would always be the best and would claim a position in front of us." (N10D)

➤ *Increasing numbers of ERP vendors*

Local vendors are expanding their array of viable products for higher education institutions and other business organisations in Saudi Arabia, in accordance with the e-government plan and rules. The demand for ERP implementation has increased gradually, as illustrated by IT director:

"As far as I know, the ERP market in Saudi Arabia has increased since 2004 as a growing number of ERP vendors offer suites of solutions in different sectors for both the local ERP system or to be developed by the organisation staff." (N3)

This forced the university under study to upgrade their system so as to add more features, but the partner influence led them to consider and obtain the best available

solution. Additionally, they compared the local market with either a local ERP system, such as Oracle, or an in-house developed ERP system that was not like SAP.

"What we found after analysing the ERP market was that many vendors appeared and expanded their range of available vendors in the country with ERP Oracle, or developed one." (N2-DM2)

As stated in the above section, the increasing ERP vendor system in the region threatened the position of the university. Therefore, one of the motivations for making the ERP system obsolete was that the SAP market did not really apply on a countrywide scale, but mainly to the public sector.

"In today's technological world, information technology is not only a tool to improve organisational performance, bit's also a means of managing and integrating activities via a solid system. The university had the previous ERP that automated its functions, but the competition between those using the ERP increased, based on its uniqueness and being the first one in the Arab region, making them seek to be the first to make this change." (N13-M)

4.3.2.3 IT and management job market competition

Job market competitions is another external influence that involves the advantages and disadvantages of the job market between public and private organizations, which attracted high-skilled foreigners and domestic Saudi workers as both IT technicians and managers for different project functions, in which many contracted with private sector firms and left the public sector as happened in the current case study. Also, the benefits or advantages of working in a private organisation are considered to be another factor which contributed to the obsolescence of the previous ERP. This section represents two sub-categories which emerged from the data analysis, namely, the public sector and the private sector. Each of these sub-categories had multiple and interrelated influences on ERP obsolescence.
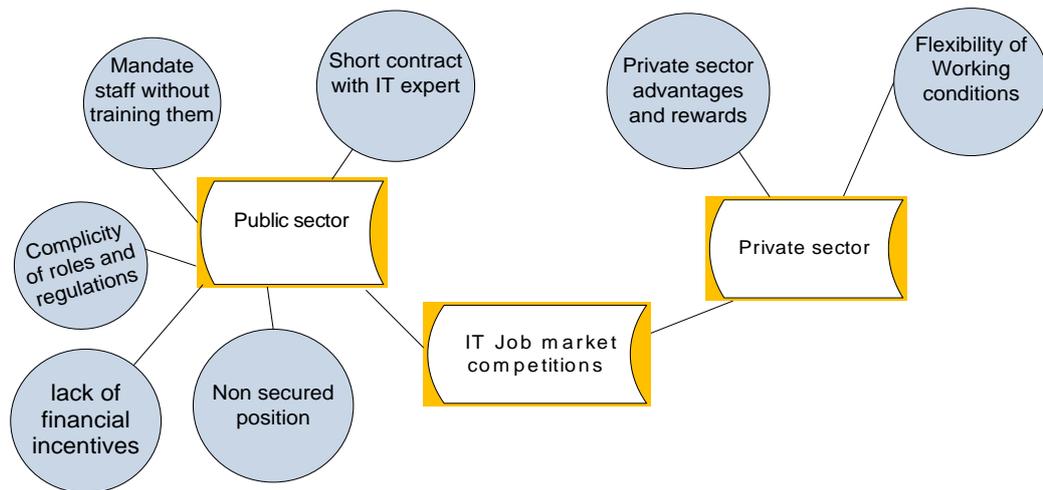
Figure 4.16: Concept map of IT job market competition

4.3.2.3.1 Public-sector issues

This sub-category clarifies and presents all the external impacts of the public sector working directives which contributed negatively to foreigner worker performance and their job motivation at the university. Different employees indicated that the public sector was not the place that they needed to work and stay, for the following:

➢ The complicity of roles and regulations;

➢ Insecure positions;

➢ Mandating staff without prior training; and

➢ A lack of financial incentives.

The following section discusses these reasons in more detail.

➢ *The complexity of roles and regulations*

This sub-category has been discussed in Section 4.3.1.1, where the intricacy of governmental restrictions on employing foreign staff are delineated, which strongly affected the availability of qualified IT and management workers at the university, thus increasing the competition between the public and private sectors and pushing the workers to leave the university.

Consequently, the maintenance and management of the previous ERP system was not possible, given the shortage of expert employees; thus, replacing ERP was the only solution available from the university's perspective.

➢ *Short-term contracts for IT experts*

This sub-category has also been deliberated in Section 4.3.1.1, but it appeared also here in the category of public sector, as the interviewee expressed that a short-term contract was considered to pose a challenge to working at the university. As a result of this limited contract period, the difficulties in managing their living expenses threated their stability, and many IT workers preferred to work in private firms instead.

"Losing valuable ERP expertise occurred often, as physical and psychological stability were not provided at the university. Some staff went to a private organisation for the ease of contracts that provided much better stability than the university contract." (N13-IT)

➢ *Non-secured positions*

In addition, many interviewed IT/managers interviewees pointed out that there are no secure positions at the university. As discussed in the section above, short-term contracts for some employees were not desired or acceptable for many reasons, including some given below:

"I was feeling concerned in terms of working at the university. I usually have the feeling of leaving the job any time. There were a lot of accumulated pressures on me." (N15-IT)

Similarly, another employee explained that *"Different mangers, even direct managers and other departmental managers, asked me to carry out different tasks that I was not supposed to do, but you know the lack of clarification in task descriptions gives them the authority to do so. As a foreigner and a contractor, I can say nothing; I just have one solution to overcome this situation, which is to work for a private company to secure my rights." (N11-IT)*

The inventory manager said that *"The regular change of mangers impacted on our IT staff job, as some went to another private organisation, as many top managers and decision makers have the authority to move the staff from one department to another without considering their opinions, forcing them to do overtime, and if these staff do not do the job required from their mangers, the mangers discontinue the contract with these workers. Therefore, most of these workers have left their jobs." (N7)*

From all the above data it is clear that staff felt their job was insecure for diverse reasons, including short contracts, regular changes of manager, having extra responsibilities forced upon them and having their contracts ended without being given clear reasons. All these causes and challenges of working in a public institution, such as increased competition between private and public institutions for qualified ERP staff, in both IT and management, meant that the unavailability of these workers impacted on the ERP system maintenance and enhanced its obsolescence.

➢ *Lack of financial incentives*

The non-existence of financial encouragement at the university emerged as another reason for some qualified IT staff and managers going to work for private organisations. As a human resource, a staff member stated the private ERP market had advantages, such as *"health insurance"*, *"travel insurance"* and other *"financial motivations"* (N9) that increased the competition between public and private bodies. Similarly, an IT staff member commented that there was a *"Lack of material and moral incentives and annual rewards at all levels at the university which made staff less motivated and unwilling to work with the university."* (N17)

Consequently, the absence of these motivations at the university led to staff migration and thus the maintenance of the previous ERP became more difficult.

4.3.2.3.2 Private-sector issues

The previous section illustrated the disadvantages of working in the public sector, which encouraged staff to move to the private sector. The private sector had two features which the university did not, as stated by many employee: *"Flexibility of working conditions" (N12-IT)* and *"Reward mechanisms" (N14-IT)* The section below discusses the reasons which led to difficulties in recruiting sufficient qualified ERP staff, thus driving the obsolescence of the previous ERP.

➢ *Flexible working conditions*

The working conditions in the private organisation in Saudi Arabia are more flexible: for instance, the process of employing staff is much easier than in a public organisation, as stated by an IT technical support person, who said that *"Many of us prefer to work for private organisation as, and many of our previous employee did, because, you know, the rules and processes are more flexible and save the contractor time., The private*

organisation only needs a few approved processes, therefore, they attract staff more easily than the university."(N15)

> *Private sector reward mechanism*

As mentioned previously, the university did not have a reward system or offer advantages that the private sectors did. In private companies, an ERP job gives staff many benefits, including ensuring safe and healthy conditions for workers; providing insurance for living fees and medical insurance, in addition to a high salary and financial incentives, and these advantages increased the competition between public and private HE institutions.

"Basically, the private sector offers highly qualified staff many internship opportunities with partners, thus encouraging previous employees and contractors to leave the university" (N8-SD)

The above advantages led the university to lose their ERP qualified IT staff and managers to competitors because these competitors could provide better job advantages and services. This emphasises that the ERP replacement was not entirely the fault of the system but that the university's failure to retain their experts was a serious issue, since they are critical for the success and continued development of the ERP. Therefore, the university needed to recognise employees' needs in order to save the life of the ERP system.

4.2.3   Competition with other HEs obsolescence

In this study, ERP obsolescence has been shown to occur in relation to other external forces, such as the HE market, since market uses advanced technology, which has better functionality and a stronger reputation locally and internationally. These advances in technology in the market made the previous ERP system no longer desirable to the university. The following section explains these HE-market obsolescence factors in more details.

> *Competition with private universities in applying latest IT*

The data analysis shows that there is also competition with non-public institutions, as private institutions and universities in Saudi Arabia are usually run by foreigners with an expertise in ERP that was not available in the public universities. So, by implementing the new ERP the university intended be at the forefront in terms of both soft resources and systems, a point raised by many employees.

"As the global and local market for higher education has grown, and as many new universities have been launched in the region, the differences between them has become varied, in terms of ERP or other technologies. Obviously, the universities' IT market develops year by year, with many universities implementing ERP, but the competition can also now apply the trend technology to provide a service... Non-public universities implemented ERP before many public organisations, and as a leading university we demonstrated that the previous ERP cannot compete with those who had a highly-qualified ERP expert, but this situation can be improved by having the leading ERP vendor." (N1-DM1)

Another example is provided by the IT director:

"Many private universities implemented the ERP Oracle as one of the leading ERP systems. We did not need to emulate them as we are an old and respected university; in contrast, we looked for the best available one. Being one of the SAP members would be of great value to us and help us to compete with our business partners." (N3)

➤ *Increasing number of international universities in the region*

"As we all know, the university faces many competitors in the higher education market. We have about 6 international universities that use the latest technology in their systems and they follow the American style. The number of staff and students at these universities has increased recently. One of my students conducted a survey two years ago, regarding working at the university and most of the respondents raised the issue of being willing to work in an environment that can provide them with new advantages and improve their skills. As a decision maker, I know that if we had continued with the previous outdated system we would not have gained any advantages in today's market. Therefore, in order to improve our skills and compete with the available international market we implemented SAP." (N2-DM2)

Based on the above statement, it is clear that the university had concerns about their external competitors, and so deployed a technology which would bring more benefits to their organisation, which in turn put the new ERP system under threat due to an outdated system and a lack of staff skills.

➤ *Mimetic Pressure*

Mimetic pressure refers to imitating what other international universities did in their administrative and academic activities.

"We really do not know how to deal with this complex situation. The previous ERP systems needed more maintenance, and we did not have enough staff and resources to deal with the system issues. Therefore, senior management suggested that it was necessary to emulate the western universities in their dealings with technology such an SAP ERP, as they had more expertise and were qualified enough to implement such a system." (N1-DM1)

"To be a leading university in the Arab region, we sought a unique high standard system. You see how the top UK and American universities use their SAP ERP system to automate their daily work processes… We found most of the ERP clients were related to the SAP ERP vendor, so then we asked SAP consultants for the use of ERP in the region, and after carrying out an assessment of SAP implementation in Saudi public universities we ended up with nothing, as none of the Saudi universities implemented SAP." (N6-M)

Both of the above quotations show that there were Western influences in the ERP obsolescence decision, as the university was uncertain how to react to their previous system maintenance and upgrading matters. In addition, it was modelled on other western university ERPs, which were perceived to be more successful. Therefore, decision makers at the university copied the western action and behaviour by implementing the SAP system.

4.4 Summary of findings and interrelationships

The findings of this study generate a theory of the perception of ERP obsolescence in Saudi HEIs, which emerged from the perspectives of decision makers, managers and IT staff. As this emergent theory (Figure 4.1) shows, the root causes of the factors of ERP obsolescence have been categorised and saturated into seven main categories that are mutually influential and emerged as the final theory. It was necessary to distinguish between different categories and the interrelations amongst them, their sub-categories and sub-sub-categories. The study shows that it is essential for decision-makers not only to distinguish between and identify all factors which impact on ERP obsolescence but also for other individuals to be aware of the nature of the process and how a single factor can cause reification across the entire system due to interrelationships between factors, as shown in Figure 4.17, which is divided into two main categories, the IEO and

EEO. The IEO refers to a variety of influences inside the given university establishment, including the following sub-categories: System obsolescence (SO) (see Section 4.2.1); Organizational obsolescence (OO) (see Section 4.2.2); Human Resource obsolescence (HRO) (see Section 4.2.3) and Management obsolescence (MO) (see Section 4.2.4). The EEO influenced ERP obsolescence in terms of the decisions made by external influencers, which brought forward ERP obsolescence, as it meant that the current system was no longer desired at the university under investigation. Here, issues such as policies and restrictions obsolescence (PO) (4.3.1), the local IT market obsolescence (LMO) (4.3.2) and competition obsolescence (CO) (4.3.3) played a role.
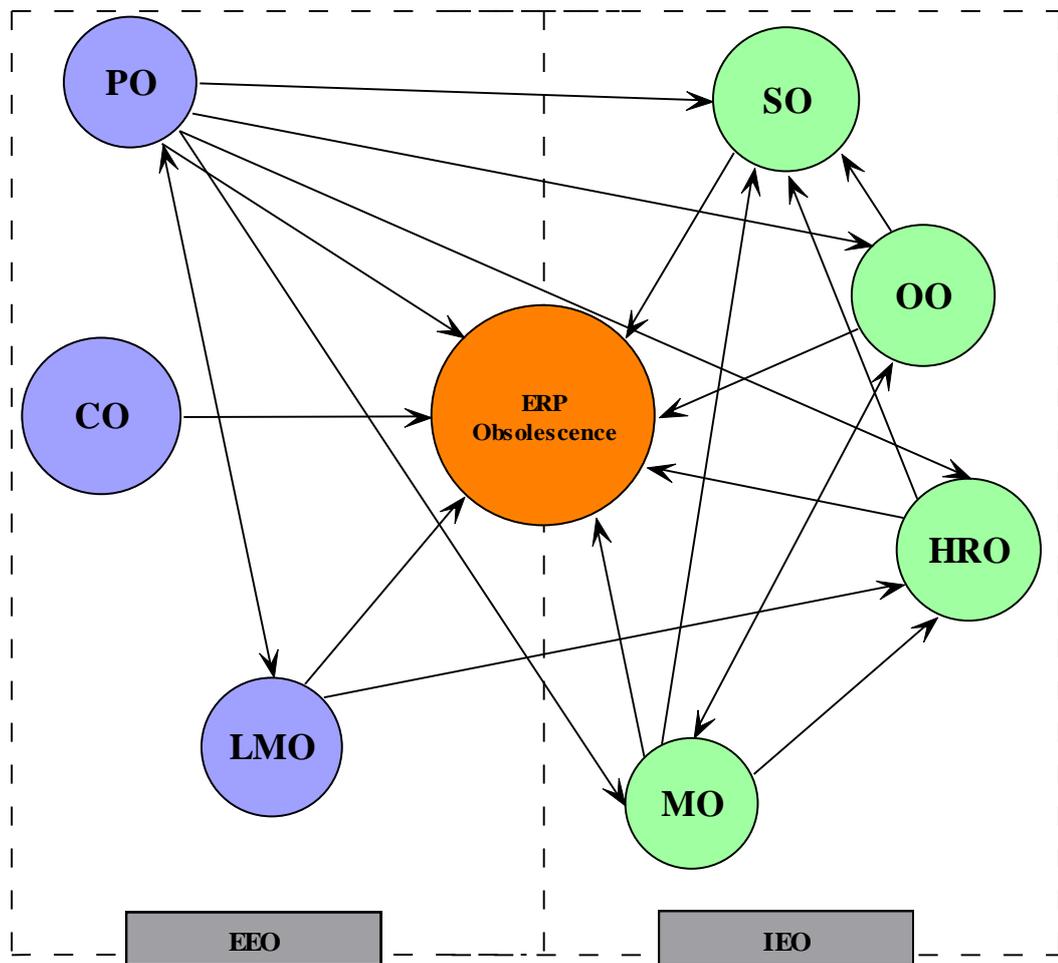
Figure 4.17: Integrated model of research findings

The figure shows ERP obsolescence in the centre of the figure overlapping both the external and internal boundary. Two type of arrow are shown in the figure: single-headed and double headed arrows. Single-headed arrows represent single relationships between categories either internally or externally: for example, the category of MO can strongly influence SO and HRO. However, SO and HRO cannot affect MO. Doubled-

headed arrows represent mutual relationships between categories: for instance, the categories of MO and OO are connected by a double-headed arrow, which means that the two categories mutually influence and reinforce each other. Similarly, the category of PO is mutually related to LMO and impacted on by HO, OO and SO in a single relationship to each, in which these categories was influenced by PO but PO was not impacted on by them. Due to the complexity and richness of the factors which emerged in this study, in order to illustrate them and their interrelationships in a clear way, the researcher has divided them into seven sections based on the sequences of identified categories, each section providing a summary of a particular category and its interconnections with other categories and codes, as given below.

System obsolescence

The data analysis identified that various type of obsolescence were related to the previous ERP system at the university, which made the functionality of the system obsolete, these being Logistical Obsolescence, Planned Obsolescence, Functional Obsolescence and Postponement Obsolescence, as shown in Sections 4.2.1 to 4.2.1.4. The data also revealed there were interrelated influences between these factors since the structure of the previous ERP system was influenced by the system plan, which tended to be short-term. In particular, the findings clearly showed that the identified system issues did not emerge and group around one category. In fact, system problems were also identified in a variety of obsolescence factors, such as management and human resource and external environmental obsolescence. For instance, it was planned for the system design to be obsolete after a short period of time, based on the decision makers' periods of tenure. In other words, the change of management led to a change of system rather than focusing on the university needs, thus making a serviceable system no longer desired.

These system issues also related to organizational structure, since the university is a hierarchal structure with centralised power, so organisational rules and authority were highly relevant to obsolescence and system functionality. Human issues also impacted on the situation in different ways. For example, once the university had new requirements that required some changes to the previous ERP functions and structure, including adding new modules and further maintenance where skilled staff were unavailable, and the new staff had incompatible skills and knowledge about the previous system, this meant that changes to one part of the system, including software,

hardware and/or human aspects for which the management, decision makers and IT staff were responsible, would impact on all other parts and make it obsolete, and vice versa. As a result of the time gap and different people's involvement in each part, the compatibility mechanism deals with the problems that develop when changes in ERP in terms of software, hardware or human aspects cause a misalignment between the three parts, eventually limiting and terminating the functionality of the previous system.

Human resource obsolescence perspective

Most ERP research focuses on technical aspects of IS, while non-technical aspects are neglected, such as human impacts. This study indicates that a number of human factors contributed to the replacement of the previous ERP system in this particular context. For instance, it was clear that there were low-skilled staff who did not have adequate skills that matched with system requirements. The study also found there were key factors in relation to management issues that negatively impacted on staff skills, such as managers and decision makers, excluding some local Saudi IT experts and system users from training programmes. This research not only shows that human resource issues impacted on the management side but that they also had an organisational impact, since there were no rules for such training and a lack of staff skills in monitoring these activities. One of the issues which also appeared in the current research context related to organisational policy was an insufficient number of employees in critical areas; due to this policy staff were unable to conduct system reviews and the required extensive maintenance. On the other hand, there were external factors, such as the impact of both the private sector and Saudi government policies on the recruitment of highly skilled staff, which had a major impact on the ERP replacement process in the case under study. This also clearly indicates that the Saudi market is threatened by its over dependence on foreign workers, and local qualified Saudi staff are usually ignored, as these non-Saudi people are not always available. This has created a knowledge gap between local staff and the system, which in turn has tended to disable the functionality and efficiency of previous ERP systems, making replacement seem the solution to the problems.

Organisational obsolescence perspective

The findings also revealed that there were noticeable organisation concerns. Since the changes in internal organizational rules, university business processes, university growth and political conditions at the current university made all of these rules and

changes inconsistent with the existing system's conditions and incompatible with other organisational components, such as employee skills, system structure and tools/equipment, such as the internet, database and hardware used at the university. The findings in this context excluded the key decision-making staff due to a high-power distance culture, and individuals with positions in a hierarchy inheriting considerable power. Employees in this culture tended to accept centralised power and heavily depended on their superiors for initiation. Thus, IT experts and managers were less likely to be involved in any decision making, such as in relation to obsolescence. Consequently, the frustrations of IT staff were obvious. For example, even if they had the capabilities, the mangers did not listen to them, so even if they did not know about a particular system they still had their inputs and their value to the whole process. In addition, the out-of-date formal intra-organisational rules that matched with ERP system requirements, such as reporting rules and documentation strategy, staff tuner, public attitudes, a lack of a change management strategy and limited awareness of the previous ERP, were key factors against the continuation of the previous ERP system at this university. Other powerful external forces and local cultures, such as changes in the IS rules, which led to the previous ERP obsolescence, required more skilled staff, while the lack of flexibility in system design also prohibited staff from making further improvements to the system. ERP market competition in the region also played a significant role in the ERP obsolescence decision, which forced the university to change their system to stay ahead of other HEs.

 The outcome of these findings show the importance of achieving alignment between organisational design (system structure, procedures, business processes, people and university requirements) and the external environment (governmental policies, Ministry of Higher Education's goal and plan, the IT market), and the need to take account of all these factors in the decision-making process to avoid any further unnecessary software obsolescence.

Management obsolescence perspective

Managers contribute in various ways toward success in any information system. These research findings identified different negative influences from the management side and their interrelations with the university design and its external environment. For instance, a lack of communication between levels and key individuals substantially increased the knowledge gap, and a lack of awareness of the changes between different management

groups and decision makers at the university. Thus, this confirmed the failure of both top management and decision makers to recognize the need to effectively use ERP system requirements, not only in terms of the integration of the system processes (technical part) but also for integration between departments and individuals (non-technical aspects). As a result of this lack of linkage, the incompatibility between different ERP systems at the university occurred. The fragmentation also augmented internal conflict between staff and destructive competition between diverse decision makers, who sought primary status. The lack of clarity and existence of conflict in both professional and university roles in terms of employing staff were also related to management's negative impact, which resulted in circumstance where the abilities of individuals did not match job requirements and thus proved to be inadequate, meaning that the performance of both individuals and the organization overall was low, preventing the success of the ERP system and so replacing it.

These findings confirm that the institution should focus on their communication factors as this is considered to be a crucial characteristic which had the most positive effect on other factors as well, and it is important for management to recognise these, as making this part of this process work will lead to ERP implementation to work effectively and save their system replacement, as well as capturing the aspects that were not fully taken into account. A flat structure is more likely to encourage people to communicate with each other. The study also indicates that these management issues were directly related to centralised power and the freedom of authority that the university gave to both decision makers and top management to select the ERP system, based on personal benefits and their further career development. Other major issues, such as decision-maker culture and educational background, educational levels and international qualifications were other key factors that had a substantial impact on the decision-making process. For example, as the decision makers and decision providers in the instance of the case studied had high qualifications from western countries, their decisions and their way of thinking and dealing with problem solving was highly influenced by this background, and tended to follow western ideas and approaches in terms of technology development and deployment, without carefully considering the differences between the Saudi and western contexts. Their primary concern was to copy practices in developed countries in order to compete internationally for their own benefit and university reputation.

It was also perceived that the selection of the specific decision-making strategies was not only dependent on qualifications, abilities and motivations of the decision makers, but also by their values and cultural beliefs as guiding principles when dealing with problem perceptions. As mentioned in previous sections, the decision maker's background, decision maker's benefits and centralised decisions were the consequences of the decision-maker culture of thinking and treating problems. Therefore, the outcome of this study also demonstrates that the different decision makers and IT staff had different perspectives on problem-solving in relation to previous ERP obsolescence, since their qualifications, motivations and culture were different. While the IT staff were keener to prove themselves on the Saudi scale; in contrast, decision makers were more willing to embrace international competition.

External Environmental obsolescence

The study shows how internal and external environmental obsolescence are different, how these factors are closely related, and the importance of understanding and considering the relationship between them to make better decisions in the future and avoid any further obsolescence. From the interpretation of participants, it can be seen that external environmental obsolescence came from different external forces, including governmental policies and restrictions obsolescence, competition from other HEs obsolescence and local IT market obsolescence.

Governmental policies and restrictions obsolescence perspective

There were clear issues related to procurement policies, which were changed very regularly, leading to difficulties in modifying the previous ERP system and difficulties for staff, as they had limited IT skills when it came to adjusting the system in order that it aligned to the new governmental instructions. They emphasised that the key decision makers at different internal and external levels of the university made the decision without communicating with each other, in terms of discussing the possible outcomes. This is also related to a lack of consideration of the system's inflexibility in terms of just imposing a rule. Thus, to avoid any future dilemmas in relation to obsolescence, these aspects should be recognised when deciding whether to make ERP obsolete or not. The findings also clearly indicate that it was not only the functional side of the previous ERP system which led to ERP obsolescence but that changes in governmental rules had a consequent effect, in that applying Saudisation rules reduced the number of qualified workers, which threatened the success of the ERP system, as most IT projects

and consultant companies in Saudi Arabia are run by foreigners and so pressurising existing workers, as the university was unable to employ more labour. Thus, changes in governmental rules require well-considered regulations that match the available resources and the environment in order to avoid gaps between different areas.

Findings also show that, although budget availability was considered to be a perfect sign of the continuing the success of the IT project, without having a proper management plan it tended to be used in unrequired obsolescence and as a result of incorrect decisions, including a lack of definition of the conditions and roles required in the IT project at the university, and giving authorisation to the wrong people. However, this shows the interrelated factors and the complicity of the situation, in which the internal factors are closely related to the external ones, and vice versa. Some participants emphasised that obsolescence occurred due to the demands of the previous ERP and its resources, including the fact that IT staff skills became outdated and the university considered it uneconomical to continue with the previous system that had a small market and low volume.

 Moreover, the educational system in Saudi Arabia is considered to be one of the underlying factors that impacted on ERP obsolescence in different ways, in terms of decision-making processes, IT and management skills and training, and awareness of ERP system implementation practices. Therefore, the outcome of this study illustrates the importance of improving teaching styles, in which the student who will be a worker in any sectors in Saudi Arabia has to improve their practical skills, critical thinking and problem solving, in order to avoid over dependency on foreign expertise and obsolete teaching techniques.

External HEs competitor obsolescence perspective

It is clear that the university had general concerns about their external competitors. One was following a western approach in deploying a technology which brought more benefit to their organisation, which brought the previous ERP of the university under investigation, due to the outdated nature of the system and a lack of staff skills.

The findings also indicate that competition with non-public institutions contributed to the previous ERP obsolescence, since many private universities in Saudi Arabia are run by foreigners with expertise in ERP, which was unavailable in the public universities. Therefore, this forced the university to replace the previous system with SAP ERP, in

order to enable the university to be at the forefront in terms of both soft resources and systems.

The Local IT market perspective

The data analysis also shows that the external influence is not limited to governmental and competitor influence, but that there are other external influences, such as vendors, consultants, partner influence and IT job market competition, all of which emerged and contributed to the ERP obsolescence process. According to the findings these influences appeared in the form of an unavailability of service from both vendor and consultant as changes happened in the local market which threatened the position of the university. Therefore, the university decided to make their previous ERP system obsolete and applied SAP ERP instead, since SAP is not implemented across the country.

The case study also clarified and presented all the external impacts of working directives in the public sector that contributed negatively to IT foreigner worker performance and their job at the university, often leading to a desire to quit their occupation and work in the private sector. Different employees indicated that the public sector was not the place they needed to work, for various reasons. (As explained in section 4.3.2.3.1)

The findings conclude that both internal environmental obsolescence and external environmental obsolescence factors impacted at the university system. Internally, this involved a lack of updating of any part of the system, including software, hardware and/or human aspects for which the management, decision makers and IT staff were responsible, which impacted on all other parts and made the system obsolete, the influence of different timeframes among the various parts and different people's involvement in the process at different stages. Externally, changes in governmental rules also negatively influenced the internal part and made it obsolete. A compatibility mechanism dealing with problems that develop when changes in ERP and/or other software, hardware or human aspects and external forces cause an inconsistency between all these parties and lead to undesired outcomes is necessary, in order to avoid the obsolescence that led to regular replacement.

4.5 Conclusion

This chapter presented and discussed the emergent theory of ERP obsolescence in a Saudi HEI by interviewing both technical and managerial staff. This was achieved

through the use of quotes from interview transcripts, interpretations by the researcher and illustrations in the form of concept maps (Figures 4.1 to 4.14). In addition, it involved how these perceptions can be categorised into identifiable factors of obsolescence, which also demonstrated the interrelationship between categories, sub-categories and codes derived from the axial coding process, thus answering the research question and achieving the research objectives. This is not the final stage of GT analysis: the next chapter (5) will address and compare the research findings with the existing literature on ERP obsolescence.

Chapter 5: Discussion

5.1. Introduction

As discussed in Section 3.6.5.1, grounded theory (GT) analysis goes through different phases (open coding, axial coding and selective coding). Once the researcher had reached the stage of data saturation, the emergent categories and sub-categories were grouped at the end of the data analysis process. Throughout the GT phases, the storyline of the previous ERP system obsolescence in Saudi Arabia's higher education institutions (HEIs) was developed. Following the emergence of the final theory (Chapter 4, Figure 4.1), this chapter confirms this emergent theory through a comparison with the existing ERP obsolescence models and theories found in the literature. This represents the final phase of GT inductive research, as advocated by Strauss and Corbin (1998, p. 51):

"The literature can be used to confirm findings and, just the reverse, findings can be used to illustrate where the literature is incorrect, is overly simplistic, or only partially explains phenomena."

Therefore, the researcher examined the current theories throughout the phases of the GT process for the purpose of theoretical sensitivity. However, as explained in Section 3.6.1, the literature review process did not yield sophisticated information or a robust theory about the phenomenon under investigation in this study. Hence, the researcher decided to examine Information Systems (IS) literature in the literature review search strategy, though this also did not give a sufficiently holistic picture of the phenomenon either.

By further reviewing the literature, a number of theoretical constructs about obsolescence in other types of research (such as in Manufacturing Studies) regarding product obsolescence were found. At the time of the data collection, there were no studies about ERP obsolescence to compare with, since the final result of obsolescence is replacement and this has been the focus of previous studies. Therefore, ERP replacement models were compared to the current research findings of my study. Although there are a couple of studies that concern ERP replacement, these studies did not provide a proper vision of the ERP replacement models in IS/ERP.

Consequently, the researcher started by examining the general product obsolescence literature in order to build a consistent framework for this research. By considering ERP

as a product and examining both ERP and the IS literature, the researcher gained the required knowledge and extended the perspective to the possible obsolescence of ERP systems.

According to Strauss and Corbin (1998), theoretical sensitivity should be integrated in the development of interview questions when gathering the first set of data, allowing the data of the researched subject to emerge from the interviews, rather than from the reviewed literature. However, after the data collection phase (2013), two different models in the context of information systems, Weerasuriya and Wijayanayake (2014) and Marchek (2015), emerged. Since ERP systems are part of information systems, these models are included in this discussion and their applicability to ERP obsolescence is considered.

Based on the above introduction, this chapter is divided into the following sections: Section 5.2 provides a comparison of the research findings with those in the generic product obsolescence literature. Section 5.3 compares the findings to specific IS obsolescence literature. A comparison of the findings of this research with Arab ERP replacement literature is provided in Section 5.4. This is followed by a discussion of the contribution of the emergent theory from both theoretical and practical dimensions in Section 5.5, and finally a conclusion of the chapter is provided in Section 5.6.

5.2 Comparison with the generic product obsolescence literature

The reviewed literature did not show a consistent use of the obsolescence categorisation related to products in general. Specifically, categories may overlap with each other and have no exact or well-defined boundaries. The inconsistency and overlap of the categories might have been caused by the emergence of definitions from different obsolescence case studies. Also, the use of the definitions by subsequent authors led to the extension of the scope of the defined categories.

The literature shows that obsolescence issues were first studied in relation to electronic equipment in sectors such as defence and aerospace. According to Rojo, Roy and Shehab (2010), these studies included a focus on industrial equipment, avionics and military systems in the period between 1996 and 2009, and then in 2012 Bartels and his colleagues studied the same area. Subsequent obsolescence studies extended the concepts to include non-electronic products such as systems, suppliers, technology, software and services (Rojo, Roy, & Shehab, 2010), all of which were in non-IS fields.

Considering ERP as a product enables this study's emergent ERP obsolescence model to be compared to other product obsolescence studies and findings.

The purpose of this section is to discuss and compare the emergent model with five different product obsolescence models from the existing literature, namely, Howard (2002), Meryer (2004), Sandborn (2007), Bartels et al. (2012) and Rajagopal et al. (2014).

These models have been chosen for their comprehensiveness, high citation levels and use in the literature on obsolescence product studies since 2010. In the following sub-sections, each of the five models will be discussed in more detail and compared to the emergent model.

5.2.1 Howard's model

Howard (2002) provided a set of obsolescence types applicable to non-electronic equipment, which included the following factors: Economic reasons; The disappearance of original component manufacturers; Specialised testing equipment is unavailable; Unavailability of manufacturing tools; Processes and procedures become obsolete; Mechanical components and materials issues.

Although all types of product groups are affected by one common attribute, obsolescence, different products might nevertheless have different types of obsolescence. The comparison conducted here is based on a general type of obsolescence, which might be applicable to ERP.

Howard defined economic reasons as including the loss of material and/or labour sources, or the cost of a product's raw materials, labour or utilities, which force organisations to replace or change the product or services. Similarly, this factor also emerged in the current research, in two different dimensions. Firstly, with regard to the new ERP system, the interviewees stated it involves the ERP SAP, on the grounds that the most popular system will bring in newly qualified staff who have exclusive skills to use this particular international system. Thus, the university's reputation will be raised, compared to a situation where the previous system is retained. This system had decreased in popularity and thus its economic benefits to the university also decreased, such as enhancing productivity and staff communication, meaning that partners would stop purchasing the university system. Therefore, decision makers considered that it was more economical to retain the new system.

Secondly, from another perspective, examining ERP obsolescence revealed economic influence as another external factor. The decisions were impacted by the economic position and conditions of Saudi Arabia, which has a significant role in increasing the university budget for such replacements. This factor also relates to the economic benefits of applying the latest IT technology in order to increase economic efficiency. Therefore, economic reasons not only refer to the organisation itself but also to the national economy, all of which led to product obsolescence in the case being discussed in this thesis.

Another category identified by Howard is **the disappearance of original component manufacturers** (OCM) or original equipment manufacturers (OEM) from the market, for different reasons (e.g. neither OCM nor OEM was interested in continuing to produce the product for economic reasons). In the current research study, manufacturers did not leave the stage; however, the use of a particular computer program in some systems was discontinued, which meant that, in effect, they exited the scenario. Since these programs were written in COBOL, and at the time of writing few organisations used this language, it meant that the software infrastructure made the system obsolete, as the tools required to integrate the software with other software applications were unavailable to re-programme the system.

The category of testing equipment is defined by the same author as the point at which the equipment becomes obsolete at the end of the production phase, as it is no longer required. This definition is not clear enough and does not seem to be applicable to ERP systems. As a consequence, testing related obsolescence issues did not emerge from the current study as a contributing factor to the obsolescence of the old ERP system.

In addition, the category **manufacturing tooling**, as Howard stated, requires the fabrication of components, which is regarded as 'tooling' (e.g. forging dies, holding fixtures, sheet metal patterns, casting moulds). Tooling issues, as defined by Howard, are not applicable to ERP systems. He defined tools as manufacturing aides in component manufacture. An ERP system setup is not strictly a manufacturing process and hence tooling did not appear as a factor in ERP obsolescence.

Processes and procedures, one of the primary reasons for obsolescence in manufacturing processes is environmental regulations or laws. According to a business

dictionary, these involve the set of rules which cover environmental issues, such as waste and pollution. In Howard's model, this means that if a material becomes obsolete, then it may cause the manufacturing process to become obsolete; or if a manufacturing process becomes obsolete, then the material may become obsolete.

Therefore, material obsolescence and manufacturing obsolescence are interrelated. Very similarly, the current research identified this factor, since many different rules and new regulations were identified as contributing to the previous ERP obsolescence. Since the university under study is a governmental institution, it is impacted on by the regular changes made by governments, which often lead to a change of system. For instance, an obvious issue is related to the procurement policies in public universities. These policies have been changed very regularly in recent years and have led to difficulties in modifying the previous ERP system and difficulties for staff, as they had limited IT skills, in terms of adjusting the system in order to align it with new governmental instructions. The staff emphasised that the key decision makers at different internal and external levels at the university made the decision without connecting with each other, in terms of discussing the possible outcomes. There was also a lack of consideration of the system's flexibility in terms of just imposing a rule. Thus, these aspects should be taken into account when deciding whether or not to make an ERP system obsolete.

Mechanical components and materials in long-life systems, was defined by Howard as mechanical parts breaking down more frequently and in unexpected ways. This is mainly due to ageing parts, or suppliers providing better parts by using new materials that are better in many aspects but could be incompatible, as the new part may not have the right mechanical or chemical properties to be a direct replacement for the older material. The absence of a direct replacement may lead to a redesign of the system. Material may also become obsolete due to changes in environmental regulations (Howard, 2002).

Based on this definition of mechanical parts obsolescence, this issue in the current research study has been identified in relation to computer servers. The obsolescence of the existing computer servers is caused by two main factors. The first is a new university requirement for higher server power and capacity. The second is the lack of servers in the market that are compatible with the deployed ones. The reason for the unavailability of compatible servers may be due to technology development and the use of different materials in the new server, which is more closely related to electronic

components. It is well known that electronic components are rapidly changing and this could have been a major factor (Rojo, Roy & Shehab, 2010) in server discontinuity and withdrawal from the market.

The participants in the current study identified more causes of the phenomenon of obsolescence than were shown in Howard's model, though Howard's findings partially support the research findings of this project, in terms of economic reasons: the disappearance of original component manufacturers; processes and procedures becoming obsolete; and the emergences of mechanical components and materials issues.

However, this study extends the scope of Howard's study to focus on all human actors, such as decision makers, management and human resources, planned organisational activities, market forces, and education system issues. These are important, since they have the potential to both save the new product and enable a better strategy to be put in place for product obsolescence. Also, the research findings contribute to Howard's study by distinguishing between internal and external environments of the product and identifying the interrelationships between these factors. The reason behind this is that an organisation has several available contracts and people involved who are in charge of supporting different systems components. Therefore, this distinction is important for any product in the organisation in order for obsolescence to be managed independently for each component, at all levels, including the project, organisation, group and individual levels.

The fact that more factors have emerged in the current study compared to Howard's model may be because of Howard's reliance on the literature, which did not allow a new contribution to be made in the form of a data-driven study. Another possible explanation for this is that the current research looks at ERP not only as a product but also from the organisational perspective, so it is not only seen as a system or software package.

5.2.2. Meyer's model

Meyer (2004) presented a model in which he discussed distinctive influences and drivers that impact the obsolescence of complex systems. These are systems that include complex processes to complete complex operations, as well as complex software to complete complicated daily routines, such as military and aircraft

businesses. This model consists of eight different categories and each of these has sub-categories in relation to product obsolescence issues namely, (a) Design and technical obsolescence issues; (b) Management issues; (c) External influences; (d) Internal influences;(E) Insufficient or inadequate design practices during the design and development phase;(F) Insufficient practice during the production phase; and (G) Inadequate practice during product support.

The next section will discuss these categories and their sub-categories in more depth.

A. Design and technical obsolescence issues

Meyer stressed that the design and technical obsolescence issues are related to different sub-categories (drivers of obsolescence) as summarised below:

1. Rapid technological developments that render the existing system obsolete;
2. Commercial off-the-shelf (COTS) components and the growing use of equipment, which impacts product obsolescence;
3. "Wear out" failure mode has an increasing impact on electronic components obsolescence;
4. Inadequate standardisation and interchangeability practices create obsolescence risks;
5. Poor management of program and design of baseline documentation creates obsolescence risks;
6. Poor design practices and inadequate redesign considerations create obsolescence risks;
7. Interrelationship of software and hardware involves additional obsolescence risks that need to be considered.

Although most of the above technical issues are related to product obsolescence and could be applicable to any ERP system, Factors 1 to 3 did not emerge in the current research study. This study did not show any influences on ERP obsolescence from electronic components and equipment. However, Factors 4 to 7 have emerged and were identified as contributing factors to ERP obsolescence. In particular, in relation to Factor 4, many issues related to the lack of standardisation emerged. Lack of standardisation in terms of the implementation or replacement management of the IS/ERP product negatively influenced and contributed to ERP obsolescence in the case studied. This lack of standardisation also refers to weak internal governance and management of ERP systems at the university level; specifically, in terms of adherence and application of the university policies and rules. In addition, the findings of this

research study indicate the unavailability of clear university guidelines and criteria that can be used to assist in the selection process of IS/ERP systems and suppliers.

The findings of this study reveal that software obsolescence is not only related to the system's technical/functional issues but also to other software and hardware deployed at the university. For example, many of the participants mentioned that there was incompatibility between the different ERP systems at the university. This contributed to ERP obsolescence and can be the result of a number of factors that have impacted the deployed ERP systems. Among these factors is the involvement of different personnel with different and incompatible interests in the decision-making processes and the lack of constructive communications between managers at different departmental levels. Another example of hardware-related ERP obsolescence is also shown by this research study. The study findings show that the lack of supplier support for the university computer servers resulted from the vendors' withdrawal from the market, in conjunction with new university requirements for increased hardware and software, which rendered the existing ERP system obsolete and incompatible with the new university requirements.

Therefore, this research's findings indicate that design and technical issues not only directly affect hardware obsolescence but also the deployed software. This is consistent with Meryer's model of obsolescence drivers, which points out the importance of understanding the interrelationship and compatibility of software and hardware in order to avoid undesired product obsolescence issues. The current findings also prove that an incompatibility mechanism deals with problems that develop when changes in ERP and/or other software, hardware or human aspects and external forces cause an inconsistency between all these parties and lead to undesired outcomes, such as regular replacement.

B. Management issues identified from Meryer are as follows:

1. Lack of participation in Obsolescence Teaming Groups (OTG) and project structures to address obsolescence management.
2. Lack of obsolescence management planning.
3. Lack of obsolescence monitoring and control of obsolescence management.

The above factors of management influence on product obsolescence are also found in the current study in different ways. For instance, one of the issues that emerged in this context in relation to management issues was that the decision makers excluded IT staff

from the ERP obsolescence decision. This impacted on the existing system performance, as those IT experts had their own value and were more familiar with the technologies and were more knowledgeable than others. In addition, they did not share decisions with other managers from different departments due to a lack of participation, and as a result an undesired incompatibility between different ERP system modules occurred. Another negative impact that influenced the choice of ERP product was the unavailability of information and documentation about the previous ERP system decision, as the decision makers and managers changed and their period of work ended. Therefore, once they left their position, no formal information about the system was available, which led the new decision maker to declare the existing system obsolete.

Moreover, the current research findings support Factor 2 regarding a lack of system planning, since the data shows there was unclear ERP maintenance or end-of-use directions regarding the system, as confirmed by many employees and described in Section 4.2.4. Therefore, further system development was difficult to apply, which led to ERP obsolescence. On the other hand, the data indicates that there is a relationship between the system plan and the decision makers. An example of this was expressed by different participants, which emerged as an internal sub-category, referred to as built-in obsolescence. This made the previous ERP system obsolete over a certain period of time as the ERP decision makers and project leader had new requirements. A short-term strategy was developed, based on their period of tenure, agreement with the vendors and the decision makers' introduction of obsolescence into the previous ERP system, with the objective of designing the system for a limited period and then pushing the university to replace it. This appears as planned obsolescence in this research. Therefore, the current research not only reflects Meryer's factors of management issues but also includes another influence factor, which is from the decision makers' perspective. Since decision makers' involvement and contributions to any IT/IS project or any product are different from that of managers, this study has also shown that their influence on ERP obsolescence is also different, and needs to be seen as such. As this study illustrates, there are diverse issues associated with decision makers' influence: for instance, decision makers' educational backgrounds, benefits and culture; regular changes in project manager; lack of communication between the decision-maker provider and decision maker; and the high impact of internal competition between decision makers, Nevertheless, Meyer failed to give further explanation about the

phenomenon of obsolescence. The reasons behind these limitations will be provided in the summary of this comparison.

The third factor, which is a lack of obsolescence monitoring and control of obsolescence management, was also identified in the current research. As stated in the above list of factors, there was no clear plan, so monitoring and control of the system was difficult. For instance, a lack of internal governance to control the IS implementation in the university was one of the sub-categories that emerged from the organisational issues. As a result, this greatly impacted on a loss of control over the project and loss of monitoring of staff, as this increased the possibility of the project team taking complete control of the ratification of its own decisions in creating an ERP replacement, without considering other important components in the process, such as the involvement of existing IT staff and even the need to evaluate whether it was necessary to make the legacy ERP system obsolete. However, since no knowledge existed regarding the previous system and its implementation, it was difficult to make any further modifications to the decision.

Another view indicated by many interviewees was that project managers acted in their own interests rather than in the best interests of the organisation. This was caused by a lack of committees and a lack of insurance in relation to the responsibility of the university to monitor all IT projects and to examine their achievements in terms of time scale in order to ensure that the plan was based on the university's objectives and budgets, instead of the project managers' objectives. This therefore led to a lack of accuracy in these tasks, and thus the lack of protection of the legacy ERP system lifecycle and loss and misuse of university assets. Therefore, this research is not only consistent with Meryer's factors but also highlights the relationship between management issues and organisational issues that led to the obsolescence of the system, and provides an explanation of the reasons why different types of obsolescence occurred.

C. External influences

Meryer also provided another list of factors relating to external influence, identified as:
 1. Legal, safety and environmental contributing factors;
 2. Political influences;
 3. Rapidly changing market trends;

4. Specific contractual requirements or budget restrictions, which may create obsolescence risks.

Similarly, the current research project identified these external influences. For example, Factors 1, 2 and 4 appeared and were reflected in the research findings under the category Governmental Policies and Restrictions.

As explained in Section 4.3, this category refers to factors caused by the external environment of companies, which contributed to the previous ERP system becoming obsolete and no longer wanted at the university under investigation. These factors were Governmental Policy Issues, Economic Issues and Educational Issues.

Regarding Governmental Policy Issues, the research findings illustrated how different governmental directives affected ERP obsolescence. These policies were identified in six different sub-categories: Rules and regulations for hiring foreigners; Rules and regulations in procurement issues; Centralisation via IT; and Applying Saudisation. The findings of the present study (non-electronic obsolescence) are consistent with those of Meryer (electronic obsolescence), with both studies demonstrating that obsolescence occurred due to the influence of new governmental regulations and changes that required manufacturers and the university to ensure it remained competitive. However, understanding these changes is critical and a lack of understanding might impact negatively on any product, electronic and non-electronic, and make it obsolete again.

This research finding from the present study differs from that of Meryer, since each individual rule was considered and identified, together with identifying the people involved and the relationship between the external decision-making changes and internal decisions, and how these impacted on the system. This is important to consider once a government puts in place a new requirement for moving towards system success and results in the development of a better obsolescence plan. For instance, many interviewees stated that there was a gap between decision makers from the Ministry of Higher Education and organisational decisions. The Saudi government had new goals in their fifth development plan, and once these goals were centralised in the form of e-government, which integrated the facilities of diverse governmental institutions, there was a responsibility to become paperless institutions. However, decisions were not considered and shared with the internal decision makers who knew about resource availability and where the university applied such complex systems, an appropriate long-term plan would be needed. All these issues and activities at each stage of the

decision-making process need to be critically reviewed and understood by all stakeholders in order to avoid system obsolescence, even if the system is functionally not obsolete.

In terms of economic influence, Meryer identified that budget restrictions may create obsolescence. Despite the fact that budget issues appeared in Meryer's model as a factor that drives obsolescence, the current research findings indicate the opposite, namely that the availability of funding is essential to maintain a system or any product, but might contribute to the system becoming obsolete, if the funds are made available for an unrequired change and improper plan. This availability of money relates to the context of this study, in which the economic position of Saudi Arabia in the world is high, which is especially the case for universities, with the university under investigation having a large budget in terms of its size and position. Therefore, this research project indicates the critical importance of the relationship between a proper system plan and the budget in relation to system obsolescence.

Another factor that caused obsolescence was the software, due to the economic inefficiency of the existing system. These factors did not appear in Meryer's model, though they may well appear in empirical studies related to high ERP market competition in Saudi Arabia, which makes it more economical to have a new system, such as SAP. This has led other universities to ask for the same system, since they share the same structure and rules.

Another factor identified in this research study but not found in Meryer's model is related to educational issues, in which the following factors were identified as driving software obsolescence: Lack of awareness of the use of IS; Lack of empirical experience of ERP; Lack of ERP studies and awareness; ERP not having been introduced as a subject then; Restricting IT training courses to professional foreigners; Most IT occupations/jobs being dependent on temporary foreign IT workers; and Teaching styles. These emergent factors may be applicable to any product, since an educational element can always be involved. Therefore, this research could extend Meryer's existing model by adding a consideration of educational issues.

The factor of rapidly changing market trends, was similarly identified in the current research, since the Saudi Arabian culture always follows the trends of the Western market. This study indicates the influence of most Western universities implementing

SAP in their universities. For Saudi universities to reach a global market, they decided to make their system obsolete and turn to SAP.

In contrast, Factor 4, specific contractual requirements, was also found in the current research. For instance, in the data analysis the contractual problems with the consultant were considered to be another driver of obsolescence, related to the situation of the shutdown of the consultancy company as a result of the rule of Saudisation imposed by the government, as most of the company's consultant workers were foreigners. This had an impact on system support, which led to ERP obsolescence. Other reasons cited by numerous interviewees related to the consultant being acquired by other universities and then being unwilling to provide continuing support for the previous ERP system.

From the research findings, another factor can be added, 'competition from other HEs', which is applicable to any product that these organisations purchase, and involves businesses in the same sector competing with each other in the application of the product. An example provided by many interviewees was that the university was forced to make its system obsolete as many other organisations had implemented an ERP locally, so the university sought uniqueness and to continue to be a lead university by replacing the previous ERP system with another global ERP one. This factor may be found in the literature as this is considered to be an empirical study.

D. Internal influences

1. A lack of knowledge and skills to analyse and manage the problem of obsolescence;

2. A lack of tools and processes in support of trade-off analysis, obsolescence predictions and forecast planning in order to make design refresh decisions or to determine obsolescence mitigation strategies;

3. A lack of accountability for obsolescence management through all the different lifecycle phases of projects.

The factors identified above also emerged in the present research in two different sub-categories, namely human resource issues and organisational issues. For instance, Factor 1 appears in this research as skills incompatibility with software, unavailability of qualified skills for both local IT staff and management, and lack of awareness and knowledge about the ERP system at the university. Factor 2 refers to a lack of tools for this project and a lack of skills to support system analysis, in which this trade-off

analysis relied heavily on external consultants and foreigners to support the analysis. Once the previous consultant had left, they employed another one, who did not know much about the system, as tools and obsolescence predictions and forecast planning were not available. Regarding Factor 3, the current research similarly found a lack of accountability for obsolescence management through all the different lifecycle phases of the project, since there was no internal governance to control the IS implementation and to manage the responsibilities of IT staff.

Other factors identified from Meyer were classified in terms of the product lifecycle, which included insufficient design during the design phase; insufficient practice during the production phase; inadequate practice during the product support phase; and inadequate support practice during the end of life phase. All products, and even human beings, have a lifecycle, but there are some characteristics or tools and activities which are specifically required for each one. For example, the factors that Meryer identified in the design and production stage are more related to electronic parts, such as specific types of assessment or the unavailability of specific tools, which need to be considered in order to avoid obsolete products. Similarly, the current study found some activities which had been insufficiently carried out in the early stage of the ERP, such as poor system design and insufficient long-term planning, which had an impact on the later stage of maintenance, another finding which is consistent with Meryer's model.

However, the current research found out more about maintenance issues and system support in relation to other factors, such as human aspects, compared to Meryer, who gave less detail about these factors, which makes it difficult to compare data. He did not follow one classification methodology to focus in depth on each area but used a different type of classification, namely examining internal and external influences, meaning technical, management and life-cycle aspects. This did not provide extensive knowledge compared to the current research, which in turn was shaped so as to draw out more explanations on specific stages of post-implementation. These were divided into different categories of internal and external influences, since all products have these. However, this does not mean that other product lifecycles were ignored, as some of the factors of ERP obsolescence appear to be related to the design and system implementation stage in this research.

Despite the fact that there are similarities in the identification of obsolescence factors in both Meyer's model and the model derived as an outcome of the current study,

regarding the phenomenon of obsolescence Meyer's study did not provide in-depth identification and explanation of the root causes of issues of obsolescence. The findings of the current research fill this gap by providing clear definitions and explanations of each category of the phenomenon in depth. This includes how these factors can impact on the product, why and at what point or points in the lifecycle. Furthermore, this research has given more explanation concerning the identified factors, which can help organisations to better understand the phenomenon of obsolescence and develop proper plans for the future of the system/product. This has been achieved through taking an empirical approach in which 17 semi-structured interviews were conducted to provide rich insights through a deep investigation of the root causes of ERP obsolescence. This is in contrast to Meyer's (2004) model, which used a global survey of the literature; this limited the ability to identify the possible factors and to briefly discuss their influence on product obsolescence. Finally, despite both studies sharing the same research aim, they differ in methodology and findings. This research can extend Meyer's factors to encompass the dimensions of educational issues, decision-maker issues, human resource issues, organisational issues, external competition by other organisations, cultural issues and the possible relationship between these factors.

5.2.2 Bartels' model

In his book, Bartels (B Bartels, U Ermel, P Sandborn & MG Pecht, 2012) provided different obsolescence categories including, Technological evolution, Technological revolution, Market forces, Environmental policies and restrictions, Allocation and Planned obsolescence. In the following paragraphs, each of these categories is compared to the findings from the current research.

In terms of technological evolution as a factor of obsolescence, the old ERP system involved high in-house maintenance costs and in-house staff training. The global availability of other ERP systems in the market, which offered better performance and where highly skilled IT professionals could be hired, ongoing training programmes were run and maintenance costs were lower, all contributed to the decision to implement ERP replacement. This shows that the technological evolution category is relevant to ERP systems, as well as electronic obsolescence. Market forces were also relevant to the ERP obsolescence decision. In this case study, the shortage of a skilled workforce in the market and the need to train staff by the university made the case for the old ERP system being viewed as uneconomical, and hence contributed to its replacement.

Technological revolution also affected the replacement decision. The old system software used old user interface technology which does not have the look and feel of the new user interface technological developments. Therefore, this category is relevant to ERP system obsolescence.

Environmental policies and restrictions had effects on the replacement of the old ERP systems. Government policies changed; in particular, the delegation of a procurement process at the university level meant that the old ERP system needed to interact with a diverse range of external software systems which it was not designed for. Restrictions as an external factor also appeared in the current research study as contributing to the obsolescence decision. The Saudi government's restrictions on the hiring of foreign workers resulted in a shortage of a skilled workforce for the old ERP system. This research study confirms the relevance of the environmental policies and restrictions as a factor that influenced ERP replacement.

Allocation, as defined by Bartels, is related to product lead time. Readily available alternative ERP systems in the market with acceptable delivery times contributed to the obsolescence decision. As found in this research study, these alternatives have a global prevalence and a strong reputation with a sound track record in performance and scalability. However, as mentioned above, they either tend to be U.S. corporates, or affiliated companies or franchises. It is all about global market domination, which is likely to be the single most powerful factor in all aspects of all organisations' decision making worldwide.

Planned obsolescence, as defined by Bartels and his colleagues, is mainly related to electronic components and equipment. The definition implies that planned obsolescence is used as a method to stimulate consumer demand.

The planned obsolescence in the current case study does not strictly fit the definition put forward by Bartels and his colleagues. Extending the definition to include other cases of planned obsolescence seems a reasonable step. In the current case study, the development plan of the old ERP system was to deploy an initial version of the system with an expected short life span. Normally, the rationale for deploying early versions of software systems, although this one did not satisfy all of the requirements, is to reap the benefits of the implemented functionalities of the system as soon as possible, which is also beneficial in the development of IT systems in terms of receiving user feedback very early in the development process. However, in this case study the early ERP

system deployment was driven by the desire to gain a strong reputation by the head of the IT department, who planned the expected useful lifetime to be short term. This case study has revealed that the expected lifespan of the old ERP system matched the decision maker's tenure. The discontinuation of the head of the IT department's service in this case presented a great risk for future maintainability and continuation of the service. The new IT department head confirmed that the unavailability of the original system designer and the poor documentation of the old ERP system contributed to the old ERP system replacement decision.

Bartels and his colleagues (2012) partly support this research finding in relation to different types of obsolescence, providing the following factors: Technological evolution; Technological revolution; Market forces; Environmental policies and restrictions; Allocation and Planned Obsolescence. The current research can extend Bartels' factors to include the dimensions of educational issues, decision-maker issues, human resource issues, organisational issues, management issues, external competition from other organisations, cultural issues and the possible relationships between these factors. These factors appeared in this research as it is an empirical study compared to Bartels', which did not include much of a focus on an internal organisational perspective.

5.2.4 Sandborn's model

Sandborn and his colleagues provided four primary reasons associated with the occurrence of obsolescence, their aim being to help to define the problem area, including functionality-improvement dominated obsolescence, logistical obsolescence, functional obsolescence and technological obsolescence. Each is described below.

- Functionality-Improvement Dominated Obsolescence (FIDO). With market trends, customer demands and competition, Sandborn and his colleagues give an example where the manufacturers need to upgrade products to maintain their market share, which causes existing products to become obsolete.

Similarly, local IT market issues also appeared as another external category in the current research, which has an influence on ERP obsolescence. These issues include prevalence for choosing global brands in the vendor market and partner influence. For instance, many interviewees indicated that the partner agreement with international companies in IT implementation forced the university to look at global trends and

follow what other international universities did for their administrative and academic activities. Also, the absence of SAP ERP in public organisations in the Arab region market made them think forward about replacing the system, in order to be a leading university in applying the most recent international system along the line of global trends.

Moreover, this research also extends the market issues to include IT and management job market competition, which also shows an impact in the current study. As most IT experts explained, the lack of rewards and advantages in public organisations led them to move to other organisations. It is human nature to want to seek a better position, and it is impossible for universities or any other organisation to accommodate these migrations. This affected system obsolescence, since the ex-employees took their knowledge of the previous system with them to the private companies which recruited them. Furthermore, there was competition with other HEIs in this study, which increased following the creation of a number of international universities in the region and private universities that applied the latest IT. This is another feature of globalisation: under the guise of 'austerity' or cost-cutting, the public-sector budgets are being slashed by central government, which opens up a space for 'private companies', which are invariably U.S. corporate companies, to exploit.

- Logistical obsolescence is caused when a manufacturer cannot procure the parts, materials or software necessary to manufacture and/or support a product.

This factor is reflected in the present study, as explained in Section 5.2.1 (Howard's model) in relation to the factor regarding the disappearance of original component manufacturers and mechanical components and materials. These have similar definitions to logistical obsolescence; it is not necessary to explain these again here.

- Functional obsolescence means that a product may become obsolete even when the current design of the product can be manufactured or supported. This occurs when the specific requirements of the product have changed, which causes the current function, performance or reliability of the product to become obsolete.

Similarly, in the current research study, there are many factors which lead system functionality to become obsolete. These concern different obsolescence issues: for example, a change in the organisation's business process requires new changes to the

old ERP, which makes the previous functions obsolete. Also, this research extends Sandborn's definition of functional obsolescence by adding the new governmental requirements and change of policies and maintenance obsolescence, which made system functionality obsolete, since there were many unsolvable aspects related to maintenance issues, such as the unavailability of ERP specialists. Therefore, this research also extends Sandborn's factors by adding human-related factors and a consideration of how these factors are interrelated.

- Technological obsolescence due to innovations in technology means that more advanced components become available. One may have the inventory of the older part and can still use it in a system. However, the supplier of the older part no longer supports it.

According to Sandborn, obsolescence is partly due to the availability of another system that is more popular in the market. Therefore, the university made its system obsolete due to the market trends.

Consequently, these factors partially support the current research model developed here. Moreover, the research findings of this project also extend Sandborn's research to consider planned, human resource, governmental, organisational and postponement obsolescence issues.

5.2.5 Rajagopal's model

Rajagopal's research (2014) identified different types of obsolescence for defence systems. Having conducted six interviews with different managers and software developers from different industries, the key findings from his study were:

- The customer passes obsolescence risk to the contractors.

By considering the university as a customer for ERP consultants, the participants indicated that there was a contractual problem with the consultant in the IT market. In this case the impact of the shutdown of the consultancy company as a result of the rule of Saudisation imposed by the government was great, as most of the company's consultant workers were foreigners. This had an impact on system support. Another reason cited by numerous interviewees was the consultant being acquired by other universities and then becoming unwilling to provide continuing support for the previous ERP system. In addition, there was dissatisfaction with the service provided. As a

result, the new decision makers decided to hire a new consultant who did not know much about the previous system since there was no documentation available. These examples show how the interrelationship between these different factors made the system obsolete. Therefore, this research extends the importance of clearly understanding and differentiating between each part of the system that plays a role in obsolescence, both external and internal.

- Lack of skills and resources to predict and monitor software obsolescence.

This research finding also confirmed that there is an influence from human and skills-related factors on two different categories of obsolescence, namely staff skills and knowledge not being updated and a lack of professional specialists' availability. Also, this study has shown how these human factors relate to management issues, since managers excluded some local staff from training. There was also a lack of control and monitoring of the applicability of the system's rules and of implementation.

- A reactive approach was often applied to mitigate any software obsolescence issue.

This appears in the current research, since the university often changed its project managers and the new managers knew nothing about the previous system, which brought a great risk of the new manager adopting a reactive approach, making the software obsolete.

- There is no mandate to use any standardisation.

Similarly, the findings of the current study confirmed a lack of standardisation for selecting vendors and products.

- The lengthy support contract did not offer a clear definition of this factor, since notes that support was beyond the vendor's capacity.

This could be applicable to ERP but it did not appear in the current research.

- Unavailability of data related to Software Obsolescence

This sub-category refers to the absence of recording and documentation of the previous work and analysis of the period of the legacy ERP.

- Inadequate design documentation and configuration.

The outcome of this project also indicates inadequate design documentation and configuration since a different system design was used for the previous ERP and other systems, which each had different people involved who did not communicate well. This thus impacted on system integration and the efficiency of the system, and made it obsolete.

- Unavailability of historic cost data associated with Software Obsolescence.

This factor is reflected in the current research in terms of the unavailability of a system plan, including all activities such as maintenance and cost.

- Unavailability of software obsolescence management plan and strategies.

This is consistent with the research findings of the current study, since management plans were unavailable, which contributed to unrequired replacement.

Although both studies shared the same aim, data collection methods and types of participants, Rajagopal's model did not discuss in detail how these factors were perceived. This may be because fewer interviews were conducted in comparison to the current study. Another possible explanation is to do with the analysis strategy of GT and the type of semi-structured interviews that were conducted in this research, which gave a more in-depth explanation and definition of the phenomenon of obsolescence, allowing the researcher to discover a different type of obsolescence.

According to the above discussion, Rajagopal's (2014) study partly reaches similar findings to this research. Moreover, the findings of this project also extend Rajagopal's (2014) research in relation to functionality, government influence, market forces, education, decision maker's issues and cultural issues.

5.3 Comparison to IS obsolescence literature

This section aims to compare the current research findings to the IS existing literature, consulting the most relevant literature for the purposes of review, comparison and discussion. In the current study, as the focus is on the factors that led to the obsolescence of ERP, the IS literature was reviewed to extract the proposed ERP obsolescence models regarding the replacement decision, in order to examine and compare them with the findings of this research. Unfortunately, there is no indication that such a model has been created yet in higher education and other business sectors; hence, based on the fact that ERP is considered as part of information systems the

decision to review and examine IS obsolescence models was made. In addition, as terms such as replacement, re-engineering, upgrading or retirement (Haddara, 2013; Sandborn, 2007; Bashir, 2011; Weerasuriya & Wijayanayake, 2014) were all used when it comes to managing the obsolescence of IS or ERP, the above papers were reviewed in order to extend the potential examined literature. In the IS context, the four most relevant models will be discussed and compared with the emergent model of the current research. Firstly, Weerasuriya and Wijayanayake's (2014) Obsolescence of information system model; secondly, Timmer et al.'s (1998) professional obsolescence of IT professionals; thirdly, Marchek's (2015) replacement decision in IS model; and finally, Pusatli and Regan's (2012) replacement decision in IS model will be examined.

5.3.1 Weerasuriya and Wijayanayake's model

At the start of their paper, Weerasuriya and Wijayanayake (2014) state that "*the field of information systems obsolescence management is a relatively less researched area*" (p. 158), which indicates the limitations and difficulties involved in terms of comparison and discussion. At the same time, it shows the value of this research, as it tackled one of the most important and critical areas of research. The main aim of Weerasuriya and Wijayanayake (2014) was to examine the factors which might affect IS obsolescence and help decision makers develop guidelines in order to manage such obsolescence. The researchers started their study by identifying and categorising the factors affecting IS obsolescence from the literature, including hardware, software and liveware. The researchers used an online questionnaire which was distributed in Sri Lanka to randomly selected firms, targeting IT managers. Weerasuriya, and Wijayanayake (2014) suggested the following model (Figure 5.1).
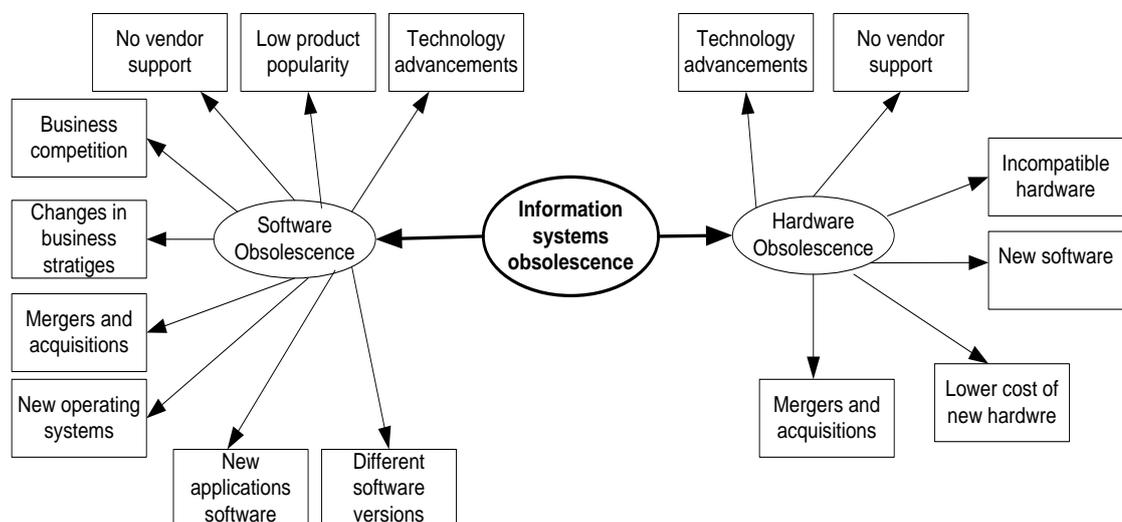
Figure 5.1: Information system obsolescence model developed by Weerasuriya and Wijayanayake (2014)

From Figure 5.1, it can be seen that the researchers accepted the fact that IS obsolescence can be categorised as either software or hardware related, and they illustrated the relationships between each category. The first limitation of their study compared to the current research project is that the findings of the current research differentiate between internal and external factors that impact on IS obsolescence; this is extremely important, as argued in Section 5.2. Also, despite the fact that their classification was based on hardware and software obsolescence, their study did not clarify the impact on other internal factors by external influences. The key aspect of an organisation's configuration is the ability to integrate the knowledge and activities of different parts or components, and the process structure of an organisation both horizontally and vertically and externally with its relationship outside its boundaries with other organisations, markets, governmental policies, suppliers and political issues, for instance (Johnson, Scholes & Whittington, 2008); therefore, this study indicates the importance of distinguishing between internal and external factors. Regarding internal factors, the internal responsibility and authority for decisions should be considered for each organisational component, including software, hardware and people. Externally, this is related to government policies, for example, outsourcing and cultural aspects, as well as how both internal and external relationships can be built and maintained to respond to an uncertain environment for certain phenomenon such as ERP/IS obsolescence.

This is consistent with general IS theories. As stated previously, ERP is only a part of the entire IS in any organisation, and requires collaboration between people, hardware and networks to accomplish their goals and requirements. Any ERP project's success not only relies on technical aspects but more importantly depends on various human and organisational factors.

Therefore, the findings reveal that ignoring aspects of internal and external factors can cause obsolescence and replacement failure. One of the important findings indicates that the change of university subsystems without considering other parts of the university system led to incompatibility between the different ERP versions and the IS system, since the decision makers were different and they did not communicate with each other regarding the implementation of any IS system across departments.

The findings also show changes in governmental rules about ERP/IS without considering other aspects of the university, such as structure and human resource availability, which led to ERP maintenance difficulties and incompatibility between the skills available and the application of the new rules. It also emerged that the change of previous hardware required the ERP system to be changed, which made it obsolete. This thus requires the university directors and decision makers not just to have overall knowledge of the factors involved in ERP obsolescence, but also to know how to integrate these factors organically.

The classification of internal and external factors of ERP or IS obsolescence sets out the basis for managers to develop tailored strategies to manage these separate issues. Consequently, they can integrate all the resources, challenges and strategies in ERP obsolescence and ensure compatibility with specific contexts. It is necessary to mention that the reason behind this limitation is related to the research method used in the Weerasuriya and Wijayanayake model, a deductive approach which was mainly quantitative. This does not give in-depth data, as several factors are vague and less detail was defined in terms of the current phenomenon. The current research applied an inductive research method to collect data about people's perspectives on the phenomenon of ERP obsolescence through the use of 17 semi-structured interviews with managers, IT staff and decision makers. This had an impact on the outcome of this research and enabled a detailed level of findings, since it included people's opinions and thoughts. In addition, the adoption of the GT method, combined with a single case study, helped this research project to obtain in-depth data by identifying the internal and external factors that led to ERP obsolescence. As discussed in Section 3.5.5.4, each of these methods has its own advantages and disadvantages, but the case study method enabled a thorough data collection and analysis process. In contrast, GT involves a systematic form of analysis but does not provide a useful research design for the research context and boundaries to collect the data from. Therefore, this combination of methods overcame the limitations in each method and provided an in-depth understanding about a single phenomenon.

In contrast, the Weerasuriya and Wijayanayake model (2014) involved distributing a survey to different sectors, providing a very limited explanation of the phenomenon under study. Their model consists of five mutually related main factors. Business competition, change in business strategies, no vendor support, low product popularity, different software versions, and other factors, such as mergers and acquisition and new

operating systems, did not emerge in this research project despite these two factors being applicable to any IS/ERP.

Given the fact that the phenomenon of hardware obsolescence necessitates the updating of obsolescent hardware and, subsequently, seller support and financing, the key factor for consideration can be viewed as the cost-effectiveness of upgraded hardware. It is notable that the hardware framework as a whole must itself be changed when only an individual element of the system needs updating, and it is often the case that, despite the orderly operation of a current system, updates can often be justified on the basis of potential cost savings. In light of this, firms which are deliberating on the prospect of updating hardware systems should examine the initiative from a cost-benefit perspective (p. 163). Due to this, economic considerations are the central issue when the option to update hardware systems is available. Weerasuriya and Wijayanayake (2014) emphasised that an additional factor of importance is the question of whether to upgrade or replace the hardware system; the scholars noted that, in the process of updating elements of existing hardware, the decision not to update the entire system can mean that new and old components are incompatible. This statement suggests that the hardware was not replaced literally but was instead upgraded to become more effective. In contrast, the current research study demonstrates the need to increase the hardware capacity, which required changing the previous hardware, and the available hardware was not compatible with the previous system: as a result, incompatibility occurred and impacted on ERP obsolescence.

In summary, the findings of the current project extend Weerasuriya and Wijayanayake's (2014) model. That is, in addition to the external influence of software and hardware, this research project found that the influences of human resource issues, management, organisational structures, governmental policies and related issues, and other technical problems were other factors in ERP replacement, since these technical factors are special characteristics of ERP. Furthermore, identifying the relationships between these various factors can be used to develop common understandings of ERP obsolescence and replacement in organisations. Nevertheless, the influence of management issues in making replacement decisions has not previously been recognised as one of the issues leading to replacement. The findings of this research suggest that management issues can lead to replacement or a change of product.

The way in which Sheldon (1966) defined management has been subject to change over time, given the fact that the early definition was formulated in a different business context to the one we presently occupy. Nevertheless, it is worth acknowledging that Sheldon's (1966, p. 32) conception of management viewed it primarily as a *function* which handles and implements policy-decisions so as to achieve organisational goals. As stated by Gaines et al. (2013), the development of IS has resulted in a situation where organisations allocate enormous sums of money (amounting the US$ in the millions) to the adoption and replacement of IS. Simultaneously, for the purpose of retaining competitiveness in increasingly saturated industries, the environment has motivated the upgrading of IS leaders, non-IS personnel and executive managerial personnel to provide them with the required capacities. Furthermore, the researchers Gaines et al. (2013) noted that the IS function's objective is shifting its point of emphasis from being efficient and effective in a supporting capacity to emphasising firm performance as the ground for competitive operations in a volatile market environment. In view of this, the researchers maintained that, in a number of situations, IS functions as a framework for customer management and product delivery, thereby emerging as a strategic collaborator in terms of firm performance (Gaines et al., 2013, p. 2). This operates on a level that is similar in many ways to other functional elements, including accounting, human resources, and marketing (Gaines et al., 2013). Given these considerations, it is important to acknowledge that the policy of implementing or replacing IS, owing to the way in which it transforms both the future and the objectives of a firm, cannot be decided upon easily. The evolving nature of the IS business means that a malleable strategical outlook is mandated, and the capacities of IT and managerial personnel must be routinely brought up to date.

In the current study, the findings indicate the negative role of the senior managers, who were not able to conceive of IS as a strategic partner but were convinced that it was a form of equipment; hence, when the replacement was made there was a lack of strategic vision and a subsequent failure to accomplish the main purpose of replacement, which was "to stay competitive". Furthermore, the situation became more complicated once the top manager negated the IT professionals' opinions in the replacement decision. Among the interviewees, it was obvious that the IT professionals did not agree to a great extent with the replacement decision and their level of satisfaction towards the replacement decision was low because to them it seemed to be an individual decision rather than a group decision. Beach and Connolly (2005) stated that "*it is more realistic*

to think of decision making as a social activity than it is to think of it as a solidarity individual activity" (p. 116). In the context of the current study, the findings suggest that the personal culture of the decision makers influenced the process of making the decision. It appears that managers and decision makers were fed with the strategic mission "to be a leading university" by the Ministry of Education, and they were keen to accomplish the mission in ways which corresponded to their culture.

5.3.2 Kenneth et al.'s (1998) IT Professional Obsolescence (ITPs) model

IT professional competency obsolescence factors have been considered in the IS field. A research study by Kenneth et al. (1998) presented a model that accounted for 44% of the factors that contributed to IT professional competency obsolescence. These factors are: Individual characteristics; Nature of work; and Organisational climate.

Kenneth et al. introduced the notion of individual characteristics as a reflection of systematic individual dispositions, needs and aptitudes. These serve as a useful indicator of an individual's behaviours and outcomes. The nature of work is defined as how professionals perceive their work assignments intellectually and psychologically. The third concept, organisational climate, encompasses an individual's perception of the work environment. Social influences, management practices and organisational rewards were identified as the main determining factors of the developing climate in an organisation.

The three factors presented in Kenneth et al.'s model are also identified in the current research study as contributors to the decision to replace the ERP system. In relation to an individual's characteristic factors, personality has been identified as an important factor. As discussed in detail in Section 5.3.4.2, educational background, including past experiences, educational levels and prestige of qualifications played a significant role in the outcome of the decision to replace the ERP system.

In terms of educational background, from the analysis of the interviews, the decision makers and decision providers in the case studied had high-level qualifications from Western countries. Their decisions and way of thinking and dealing with problem solving was highly influenced by, and tended to follow, Western ideas and approaches, in terms of technology development and deployment. There was a lack of careful consideration of the differences between the Saudi and Western contexts, which involves organisational, cultural and economic issues, governmental policies and human

resources availability. Their primary concern was about copying practices in developed countries in order to compete internationally.

In terms of personal benefits, from the analysis of the interviews, there was a clear indication that supporting ERP obsolescence involved personal interests, in which those interested referred to the benefit of implementing new ERP systems well-known as SAP, in order to build relationships locally and internationally with world-class IT professionals and IS vendors. By undertaking this type of connection, the decision maker cemented his reputation in the IT market locally and internationally.

In terms of personal culture, the interview findings also supported the view that cultural differences between staff in the university influenced the decision-making process. This is exemplified in the work undertaken by M2, who stated that, at the university, the Egyptian workers' culture differed from other workers in terms of solving problems; they were more keen to work in Saudi Arabia and to achieve high standards to prove themselves, and they were flexible when dealing and funding. This point is also reinforced by the Egyptian IT worker who suggested that, as he was from an Arabic country, this gave him a greater ability to work and understand the role and regulations of the Saudi government than other workers. It appears from the above examples that different cultural beliefs influenced the replacement decision.

The nature of the work factor, which is related to the intellectual and psychological perception of work, has an impact on an individual's professional development and current competency. In this research study IT professionals were found to look at their work in a negative way. Ambiguity of professional roles and conflict of tasks resulted in low performance, poor motivation and a lack of job satisfaction, which led to frustration and work pressures. This situation made it difficult to retain a highly skilled, status-focused workforce, and hence the IT department professionals had low competency and their skills were not up to date.

The organisational climate factor is also recognised in this study as having an impact on ERP obsolescence. In particular, the absence of guidelines, monitoring processes and policy enforcement were identified as factors that impacted on the development of IT professionals' competencies and skills updating. Insufficient or non-existent reward and incentive policies, like financial incentives, travelling and health insurance, contributed to a low retention rate and a less motivated workforce at the IT department. Social influences among the IT professionals were found to have had an impact on staff

morale. In particular, bias and prejudice by project managers, who are not necessarily IT professionals, influenced IT staff training and their non-inclusion in decision making in relation to the ERP system.

Consequently, according to the discussion above, Timmer et al.'s (1998) model partially supports the developed model in this research project, since their aim was to evaluate the relationships between manageable work context factors and degrees of obsolescence of ITPs and IT professional obsolescence. On the other hand, the model does not look at the external factors while the current research study explores different types of obsolescence that impact on each other, showing that not only management and organisational factors led to ITP obsolescence but also other system issues, such as software obsolescence. Moreover, other external factors, such as local IT market competition, also affected ITP obsolescence, due to the availability of new IT staff and managers who had updated skills that matched with the high-standard international IT system. This can bring advantages to organisations and rapidly increase the institution's reputation to compete with other HEIs. This explanation highlights the importance of understanding the relationship between each part of an organisation's components that can make each other obsolete.

Despite this difference, the sample of this study and Timmer et al.'s (1998) study are the same in terms of the type of people who participated. But it can be noted that Timmer et al.'s model does not look at the external factors such as governmental, IT market, education system and partner obsolescence. This limitation could be due to the deductive approach that they used, which relied on the hypotheses of previous research and distributing questionnaires to multiple organisations. It is also due to the focus being on a component level rather than at an assembly level, which looks at other aspects of the system component obsolescence. In contrast, the current research relies on an inductive approach to investigate a single case study that provided more explanations of the phenomenon of obsolescence from different aspects of the system.

5.3.3 Marchek's (2015) model

Marchek (2015) developed a theoretical model based on a literature survey on decision making and technology acceptance, called the Technology Obsolescence Model (TOM). The initial model contained factors and elements that are believed to be the most relevant for the replacement of obsolete information systems. Subsequently, this model was tested through studying a pre-screened purposive sample. The refined model

contained the following factors: Obsolescence imperative; Cost; Technical factors; Benefits; Organisational Support.

Each of these factors contained many elements that contribute to its associated factors. Marchek (2015) summarised his findings by suggesting that the technical factors came close to achieving statistical significance. Obsolescence imperative and cost were identified as statistically significant. Also, the benefits factor was identified as the most important factor. Organisational factors were examined, but no clear evidence of their importance was found in his results.

The TOM model focuses on the measurement of the factors that influence the replacement decision of IS systems. In the current research study, several factors were identified as having impacted on the decision to replace the ERP system. Human factors, including management, decision makers' and IT staff issues, were found to have the most influence on the decision to replace the ERP system. Also, these internal organisational factors have been found to have a relationship with the external environmental influences, such as governmental regulations, local IT market competition and partner forces. The deficiency of the TOM model in identifying the importance of these elements is due to the approach used in identifying the influences of replacement decisions. The approach of the current research study is based on data collection through interviews which subsequently were subjected to an extensive data analysis process in order to understand the phenomenon in more depth and detail.

5.3.4 Pusatli and Regan's (2012) model

Pusatli and Regan (2012) derived a model that focused on the replacement or maintenance decision of IS systems. The factors identified in the model were based on an extensive IS literature survey and were confirmed by interviews with industry participants.

In this model the change request is considered as the core factor in maintenance or replacement decisions, and it is divided into six sub-factors, as follows: Productivity; User feedback; Available support facilities; System specialisation (degree of system specificity); Popularity (user community support); and Prevalence and severity of errors and failures.

Noticeably, this model did not account for the social and economic factors that may affect the system maintenance or replacement decision. In this model the change request

is the driver of this process. Productivity, user feedback and available support facilities were the immediate factors identified as the drivers of change. Although this model includes productivity, it is not precisely defined by Pusatli. He stated that the metric for IS productivity is controversial and broadly refers to effectiveness, efficiency, operational performance and availability of the IS systems. User feedback is identified as an informant for change. Support facilities' availability includes training, documentation, a 24/7 help desk and forums. The other sub-factors that lie behind these are system specialisation (degree of system specificity), popularity (user community support) and prevalence, and severity of errors and failures.

The identified factors for IS replacement in the current research study spanned a wider domain of factors than those in Pusatli's model. In particular, external environmental factors (including governmental, market forces, the education system and cultural issues) and internal organisational factors, such as organisational, human resources and management issues, were found to have an impact on the replacement decision.

Maintenance has been found to have an impact on IS productivity in the current research study. A lack of documentation on the IS system and IT staff skills issues and training led to an increase in maintenance failures, which in turn led to limited productivity of the system as identified by Pusatli. This, combined with the external environmental and internal factors mentioned above, eventually led to a change request that resulted in the ERP system replacement investigated here.

The internal organisational factors in the current study involved limited user feedback input in the change request process. As mentioned above, user feedback plays the role of informant regarding the IS system. Limited user feedback (resulting from the IT professionals' and managers' exclusion from the replacement decision process) affected the replacement/maintenance process negatively. The organisation did not follow a rational procedure in the ERP system replacement decision-making process and in particular it depended on the intuition and experience of an individual employed by the organisation. The deliberate exclusion of user feedback from the replacement decision process was identified in this research study as having contributed considerably to the replacement decision. These research findings concur with Pusatli's model in relation to the importance of user feedback in the replacement decision, and also show that human and organisational factors, which were not considered in Pusatli's model, can have an impact on user feedback.

The findings of this research study, in relation to the availability of support facilities, as defined in Pusatli's model, show a lack of official documentation, regular training and reporting facilities. However, other support factors have been identified by this research study and are not included in Pusatli's model. Human factors, in particular a shortage of a skilled and knowledgeable workforce in the IT market, had an impact on the ERP system replacement decision. Other factors, such as availability of funds to support the day-to-day running of the ERP system, have also been identified as factors contributing to the replacement decision. The researcher believes that the definition of the support facilities element of Pusatli's model should be expanded. In particular, human and organisational (external and internal) factors should be included, such as staff recruitment and retention, budget restrictions and market competition for available workforce skills, which is vital for ERP system support.

The IS system popularity factor has been identified in the current research study as a contributor to the ERP system replacement decision. The old system had low international popularity and was deemed to hamper the reputation and image of the owning institution, as mentioned in Section 4.2.2.5. In this research study, popularity entered the decision-making process directly and was not anticipated by Pusatli's model. In particular, the reputation and image of the institution was thought by the institution to be served better by adopting an ERP system with high international popularity and a strong support base.

Pusatli's model needs to be extended to include other factors, in particular economic and human factors, such as managers', decision makers' and IT experts' issues. Also, the effects and the relationships of the model elements need to be extended and the definitions elaborated. In addition, the model does not explicitly consider the obsolescence phenomenon on its own but implicitly includes it in the replacement process, which is a weakness of this piece of research.

5.4 Comparison with ERP replacement literature

To the best of the researcher's knowledge, and after a very extensive literature review, no study of ERP obsolescence in the existing literature. As the final result of obsolescence is replacement, the ERP replacement models here are compared to the current research findings in order to confirm the research findings and to identify where the literature is incorrect or overly simplistic in this specific area in relation to this phenomenon (Strauss & Corbin, 1998). Therefore, this section discusses two ERP

replacement models, namely, Haddara's (2013) and Microsoft Dynamics' (2008) models.

5.4.1 Haddara's (2013) model of ERP replacement factors

Haddara (2013) used the term 'retirement' to refer to the replacement of ERP. He used a similar research approach to the current research study in order to develop an inductive exploratory theory. He conducted more than 40 interviews. The participants included a mixture of stakeholders, such as the IT manager, IT staff members, business function managers, and mid-level and front-line employees. The findings of his study suggest that ERP was replaced with SAPERP for many reasons, including, functional managers and users, were not engaged in the decision-making process; The ERP decision was mainly made by IT people; The functionality of the system did not meet minimum business requirements; an inability to augment all information of the business units; Complex reporting techniques; a lack of web-based interfaces; a lack of awareness regarding the main method of official implementation; and The wrong choice; and No implementation contract.

As can be seen from the above list of factors, the novel aspect of Haddara's study is that the researcher was able to identify some of the cultural and management issues which should be taken into consideration before making a decision regarding ERP replacement, such as the need to engage functional managers in the replacement decision and the need for the IT professionals to collaborate with managers to make the decision. Similarly, in the current study, the findings indicate that the situation becomes more complicated if the top manager ignores the IT professionals' opinions regarding the obsolescence decision. Among the interviews, it was obvious that IT professionals did not agree to a great extent in respect of the obsolescence decision, and their level of satisfaction in relation to the decision was low because to them it seemed to be based on individual rather than group decisions. Beach and Connolly (2005) stated that "*it is more realistic to think of decision making as a social activity than it is to think of it as a solidarity individual activity*" (p. 116). In the context of the current study, the findings suggest that the personal culture of decision makers has an influence on the process of making the replacement decision. It appears that managers and decision makers were fed with the strategic mission "to be a leading university" by the Ministry of Education, and they were keen to accomplish the mission in ways which corresponded to their culture.

Furthermore, it has been argued that the process of decision making can be very critical because it can be biased by different factors. According to Cooper (2007), humans purposely (unconsciously) search for facts that communicate and agree with their initial beliefs. If the facts are not as clear as expected, humans attempt to interpret them in the way that best matches those beliefs. Al Suwaidi (2008) stated that five different cultural values influence the decision-making process in the Arabian context, namely nepotism, face meanings, connections, consultation and time and thought-process orientation. He added that *"Arab managers have a long history of entrepreneurship that influenced them in creating certain norms in the decision-making process.... An Arab with an executive position has the tendency to focus on short term effects. Western executives should be aware of this issue; they need to emphasize the short-term effects of the business relationship/deal in order to make the proposal convincing and appealing to the Arabic executive"* (p. 30). This statement is supported by the present study to the extent that top management decision makers were influenced by the glory of the trend towards having the most recent technology and they did not listen to the IT experts who showed an interest in developing the previous ERP system rather than making it obsolete. It was obvious that the decision-making process was biased by their cognitive understanding and the factors of the Arabic culture. Nevertheless, further studies investigating the cognitive and motivation biases in such research are recommended.

The current study has also shown a lack of coordination between departmental managers in terms of deploying the ERP system, which led to incompatibility between different information systems and ERP systems at the university, and made it difficult to conduct overall system planning and to implement further improvements and revisions. This brought about a reduction in operational efficiency and ERP performance at the university. This lack of coordination or engagement of managers was not only influenced by cultural issues, but also by organisational influences, which gave the authority for implementing ERP to different managers in separate units across the entire university. This impacted negatively on the ERP replacement decision, since ERP is not simply an integration of functions but also requires people's involvement and communication. As also shown in this research study, due to a lack of communication, sharing knowledge and documentation about the previous ERP system implementation led to difficulties and failures of new staff to maintain and continue to support the system, as the previous project manager and some IT staff left the university and took their ERP knowledge with them. Therefore, the university had to recruit a new project

manager, whom, it turned out, had different opinions regarding the replacement decision. Similarly, Haddara in his research mentioned that the decision-making process is neither documented nor known to them, and in 2008 the situation became very dangerous, as the main manager resigned from the company and they recruited another IT manager who did not know much about the previous system. However, he did not indicate or explicitly state whether this action played a role in the replacement decision or not.

Additionally, in Haddara's study, it seems that the replacement decision was forced by the failure of the functionality of the ERP system, which did not meet minimum organisational requirements. In contrast, the current study shows that new changes forced the decision to replace ERP, which made the system obsolete. These forces included a change in the university business process and university growth, which brought new requirements. Also, many IT staff members indicated that the previous system's functionality worked well but there was some reduction of system functionality due to integration issues and maintenance problems.

Recalling the factors identified by Haddara in relation to the inability to augment all the information of the business units, the findings of the current research reflect this factor in the form of data problems, such as a lack of data cleansing processes, which included inconsistencies, inaccuracy and missing data, which directly impacted on integration and data workflow. These problems were caused by a shortage of effective staff training, limitations in the number of people involved in the training phase and a lack of long-term system planning. This data issue required heavy maintenance, which thus means more staff and time; therefore, decision makers thought it would not be beneficial to retain the previous ERP system, which had more technical issues that were difficult to overcome, due to the continuous running of the system.

As can be seen from the above discussion, Haddara did not define or explain how these factors impacted on the replacement decision. In contrast, this research finding from the current study explains the causes of the lack of augmented information for business units and how other factors, such as a lack of availability of appropriately skilled staff, impacted on integration and how these impacts were interrelated.

Haddara also mentioned complex reporting techniques as another contributory factor to the replacement decision. This issue also emerged in the current research, but Haddara did not explain or define what he meant by this factor. However, the current research

study defines reporting issues as the difficulties involved for staff in retrieving data for reporting purposes. This identified factor had two main causes, namely unsolved problems and reporting delays, which also played a role in the replacement decision.

In relation to the interface limitation, in this research study, the interface of the previous ERP system was in the old setting of COBOL, the equipment for which is no longer supported on the local market and has become obsolete; thus, ongoing maintenance was difficult to accomplish. Another cause stated by decision makers was that the users were dissatisfied with the poor quality of the interface and its old style, which caused inflexibility and the inability of the system to obtain the data and information it required.

From the perspective of implementation issues that contributed to the replacement decision, similar to Haddara's findings, the analysis of the current research data shows that the various factors that led to ERP obsolescence were not only related to the software itself but also relate to lack of control at the university level, in terms of monitoring their rules and system implementation and its applicability at the university. These causes are: Misunderstanding of ERP requirements; Lack of internal governance to control the IS implementation; No clear measurements or criteria for choosing vendors and products; Previous product's low level of popularity internationally; Lack of national experience in terms of dealing with ERP systems; The nature of decision-making processes of IS implementation that affected the previous ERP system and contributed negatively to its obsolescence. However, Haddara did not clarify these issues, and it is important to do this in order to avoid any further unnecessary replacement in the future.

The last two factors in Haddara's model did not emerge in this case study as factors in the ERP replacement decision. This may relate to the development of the in-house ERP system, which did not involve any issues related to software selection.

The above discussion shows the complexity of the situation and how different individuals and organisational rules can impact on the replacement decision with accompanying unsafe outcomes, which were not clarified by Haddara's model, but are clarified in the current research. Despite both studies using the same data collection method, the explanation of the factors might relate to the use of GT processors which give more in-depth analysis of the phenomenon, as well as the ability to group and categorise the different factors involved in the DM process and to identify the

relationship between these factors. Therefore, the model proposed by Haddara (2013) partially supports the model developed in the current study. In fact, the model in the current study adds to Haddara's (2013) model, since it was found that the external factors, such as governmental policies and restrictions, competition with other HEIs and local IT market issues, played a role in the decision-making process which led to ERP replacement. Moreover, this research project identified the influences of other obsolescence factors, such as human, planned and postponement obsolescence.

In addition, this research has proven the importance of understanding the distinctions and relationships between these identified factors. Haddara's study also linked ERP problems directly with ERP replacement; the findings are relatively simple and did not explore the complicated situation in full. However, the current study adds a layer of obsolescence between problems and ERP replacement, developing a more holistic and in-depth set of findings involving different categories of obsolescence and associated problems. Finally, it is beneficial to mention that these extended factors do not appear in Haddara's model, which not only refers to the method being used but also to the different nature, size and context of public and private organisations, in which different government rules and budgets have to be adhered to.

5.4.2 Microsoft Dynamics' (2008) ERP replacement drivers

Encore Business Solution (EBS, 2008) in a white paper presented five drivers of change for a new ERP system. The paper focused on answering the question of whether to replace an organisation's ERP system with a new one or to keep the older system. The paper indicates that each company has its own unique problems when it comes to ERP system replacement. EBS stated that the ERP replacement decision is driven by five drivers, namely, Business Processes; Systems Technology; Software Vendor; Reporting and the Total Cost of Ownership.

EBS stated that business processes driven by older ERP systems become constrictive to the business. In particular, an older ERP system can force the business to develop its processes around the ERP system, resulting in a suboptimal business process. New ERP systems can offer more flexibility and hence better business processes, based on best practices. In the current case study a new requirement for the university impacted on the business processes. These new requirements involved the linking of the university with external stakeholders and establishing a new e-management department. The shortage of a skilled workforce familiar with the old ERP system forced the management

department to hire new staff with skills more aligned with the new ERP system. This caused the old system to become less easy for the IT department to maintain. Instead of training the new workforce with the old ERP system, the decision makers opted to replace the ERP system with a new one. Business processes in this case study had a direct impact on the replacement decision. This shows the importance of taking into consideration each organisational component, including business processes, software elements, human resources and the impact of external factors.

System technology drivers, as stated by EBS, are concerned with integration, availability of support and resources, and customisation. In relation to this driver, the shortage of a workforce skilled at using the old ERP system was identified as a significant factor for the replacement decision, in addition to issues related to the integration of the older system with external stakeholders. As mentioned in Section 4.2.1.1.1, the managers did not find the right people who had the right system skills, such as expertise in the programming language, which also refers to a lack of ERP skills in the local market. Hardware resources were also identified as a contributory factor in the replacement decision. In particular, the existing hardware servers were not able to provide the newly required capacity and throughput.

In relation to the software vendor driver, EBS stated that two main factors had a major impact on the decision makers' change of ERP system. These factors are vendor support and development and vendor acquisition or merger. In this case study, it emerged that the reputation and popularity of the vendor's ERP system contributed to the replacement and selection of the new ERP system.

Reporting issues were identified in this case study. The staff found it difficult to retrieve information from the older ERP systems due to the complexity of the report format. The findings of this case study are consistent with the EBS reporting driver, which is concerned with information accessibility.

The fifth driver of ERP system change, as stated by EBS, is the total cost of ownership. In this case study, it was thought by the decision makers that the new ERP system cost was lower than the older one and that the new ERP system was more popular and could save time and effort. The EBS white paper gives tables listing the items that contributed to the cost of ERP systems ownership, divided into hard and soft costs. Hard costs are the quantifiable cost and can be estimated by the decision makers. Soft costs are not easy to quantify and are not likely to be known to the decision makers. The findings of

this case study in relation to cost impact on the ERP replacement decision are consistent with those in the EBS white paper.

The EBS white paper does not cover factors like government policies, IT job market competition, partner influence, more general economic factors, educational issues and management issues. This study has found that these factors contributed to the decision to replace the old ERP system. In particular, management issues were the most significant factor that contributed to ERP replacement. This factor emerged from this study as result of its empirical nature and its unique context. Furthermore, the above comparison was able to show the importance of cultural impacts on obsolescence, which has not been considered by previous research.

After comparing the findings with the current literature, which is mostly Western literature, the outcomes show that a culture element contributed to ERP obsolescence, which is considered to be a new contribution to this field of obsolescence. Therefore, this section will explain this cultural influence in more depth in relation to the emergent theory.

When it comes to the meaning of culture, there is a wide set of definitions in the literature, but the most common one is provided by Hofstede (1980) as "*The collective programming of the mind which distinguishes the members of one group or category of people from another*" (p. 3). In later years, Hofstede (1994) was able to adapt the strategic role of culture to include other organisational and personal elements and announced the creation of his theory of culture, with five dimensions. Understanding these dimensions can help us to understand the influence of culture on making replacement decisions. Hofstede used a 100-point scale to identify the nature of national cultures. If a national culture scored 50 or over for a particular dimension then it was considered to be high, while it was considered to be low if it scored lower than 50. According to Hofstede's scale, Saudi Arabia is defined by Power Distance, Masculinity, Individualism, Uncertainty Avoidance and Long-term Orientation compared to other countries, such as the United Kingdom (UK), as shown in Figure 5.2 below.
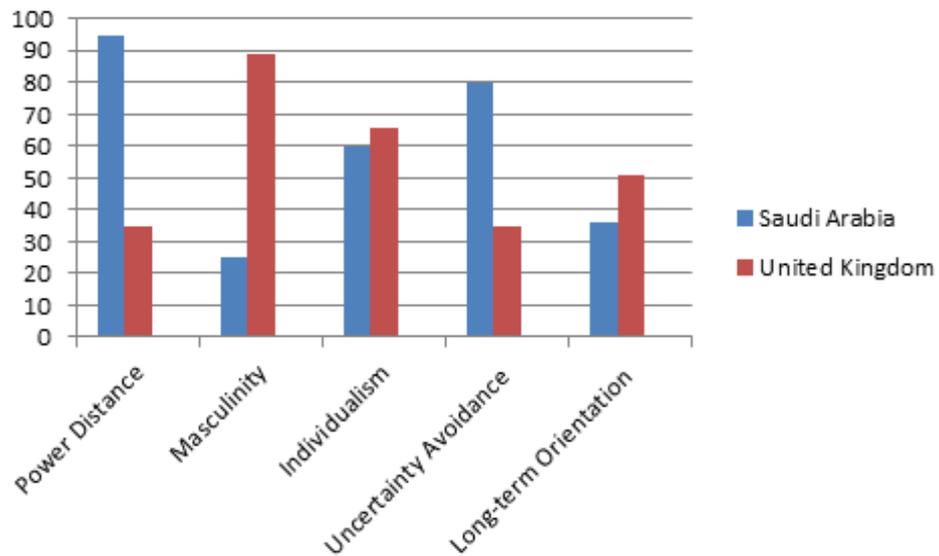
Figure 5.2: Cultural Dimensions scores of Saudi Arabia compared to the UK

http://geert-hofstede.com/saudi-arabia.html

Related to the above chart, the findings of this research prove the influence of cultural dimensions in different ways, as in the following:

Power distance: suggests that not all individuals in societies are equal. Peng (2009) referred to this as "*The extent to which less powerful members within a country expect and accept that power is distributed unequally*" (p.65). This quotation is consistent with the finding of this study, that top managers saw themselves in power and having control, while IT professionals did not have equal power and accepted and obeyed whatever directions came from those in higher positions of authority. They did not debate the use of the Internet as an educational tool in the university; rather, it was simply imposed on them by university senior managers. Some of the participants were not committed to its use but at the same time did not actively reject it, out of respect for their superiors.

Furthermore, the culture of top managers corresponds to the culture of the education system in Saudi Arabia and with the country's hierarchical society. People in such a context tend to accept a hierarchical order in which everybody has a place and which needs no further justification. Centralisation of decisions is expected and accepted and subordinates accept orders. Hence, the decision makers did not consult people at the lower levels on the most important IS/ERP issues. Consistent with this pattern, the decision to make the previous system obsolete was taken at a high level, without discussing and considering alternatives with IT staff and IS managers. As a result of

adopting this way of managing things inside the university, each department started to explore ways of implementing different information systems to gain benefits, without referring to any specific guidelines or frameworks. Given that decision makers may often not be experts in ERP usage, maintenance problems and obsolescence, this issue impacted negatively on the previous ERP in the university, which created incompatibility between different ISs and allowed them to implement different ERP systems with different vendors, as the finding shows. Consequently, this impacted on the alignments between these systems, as well as reducing the IT staff's role in developing a strategy for ERP improvements, which thus led to undesired outcomes, such as further obsolescence and replacement.

One of the other negative aspects of the influence of power distance is related to selecting IT managers and training staff at the university. Some participants were not happy that the university managers did not select the right people to manage and train them for the previous ERP. In Saudi Arabia, as in the rest of the Arab World, it is well known that selecting managers is usually based on some societal aspect of managing relationships with superiors in society (Al-Sowayegh, 2012). These aspects might take the form of personal, family or tribal relationships with the key power holders in society; others are based on political issues supported by powerful people in the regime, but people are rarely selected based on their qualifications. Similarly, at the university, managing things in this way negatively affected attitudes towards the replacement of ERP because participants were not persuaded that university managers had selected the right people to carry out the process. The same issue was also applicable when people thought about higher levels of management, when the government launched major transformative projects, such SAP ERP, without consultation, and then authorised unqualified people to lead them in universities. As a result of this strategy of selecting unqualified staff, the replacement of the new ERP did not create a successful system as the system users were not willing to accept the change, which led to resistance to the new system, and to replacement failure.

From another perspective, the power distance element appeared also in differences in the way that managers looked to experts from Arab and Western nations. According to the findings, the managers tend to have greater trust in experts who have inherited ideas from Western culture rather than from Arab culture. Badry and Willoughby (2015) compared this perspective to the method used by Arab Gulf when they reformed their national universities at the beginning of the 21st century, as Western experts were

invited to carry this out. The phenomenon of 'Westernisation' appeared, dominated and took over many Arab scholars' jobs. In other words, Arab scholars who established the universities were replaced by Western experts. In addition, the Gulf governments brought Western experts to train staff and faculty to transform the culture of the public universities along the lines of the American model. According to Romani (2011, p. 45), "*One important pattern characterizing the current academic boom is a dual process of privatization amidst globalization*" Two-thirds (around 70) of the new universities founded in the Middle East since 1993 are private, and more and more (at least 50) of them are branches of Western, mostly American, universities.

Moreover, individualism vs. collectivism, or which is first, (I) or (we), is a significant part of cultural difference. As explained by Peng (2009), a culture characterised by individualism underlines the importance of selfhood and, moreover, considers that identity is determined by elements that are unique to a particular self. On the other hand, a culture characterised by collectivism interprets identity with reference to societal groups. The prevailing expectation in cultures which display a tendency in the direction of individualism, for example the United States, is that people will value their own interests and those of their close relatives over those of the collective or the group. In this study, it appears that managers hold the responsibility for making the replacement decision in order to meet the mission of the university. They showed their solidarity and commitment towards making the decision and tackled the required actions and events.

Another key cultural dimension is that of masculinity versus femininity. Generally, cultures characterised by masculinity emphasise the importance of competitiveness and achievement, often incentivising conduct of this kind; Peng (2009) described that high masculinity cultures (of which Japan is the prime example) display easily-observed gender distinctions while low masculinity cultures (of which Sweden is the prime example) show both genders engaging in similar occupations, for example, in nursing, teaching, and the domestic sphere. Feminine cultures incentivise the orientation of abiding by societal values, expressing concern for people, and emphasising quality. Hofstede (2014) elaborated on this dimension, stating that the Kingdom of Saudi Arabia, insofar as it achieves a score of 60 on the masculinity versus femininity dimension, can be viewed as a masculine. The scholar noted that, due to this, it will be characterised by a focus on occupation, conclusive and self-assured managerial decision-making, and a predominant environment of competition. According to the

findings of the current study, the managers who made the decision are males, as they focus on achievement and competition and there are no females involved. There is a lack of collaboration and communication in a masculine culture, which is needed if effective decisions are to be made in organisations.

Another example of cultural difference can be the dimension of uncertainty avoidance, as described by Peng (2009, p. 4), can be divided between high and low. High uncertainty avoidance cultures value occupational stability, occupational progression, and holistic pension packages, and they are often averse to the uncertainty created by chance. Contrastingly, low uncertainty avoidance cultures display a stronger predilection for innovation and risk-taking. Smith and Abdulrahman (2013) highlighted that the university-level education sector in Saudi Arabia scores highly on the uncertainty avoidance dimension. Al-Swailem and Elliott (2013) argued that, given the prevalence of multicultural personnel at such institutions, the adoption of culture skills awareness by managers is critical. The scholars (Al-Swailem and Elliott, 2013, p. 42) further noted that a central characteristic of leaders in institutions of this kind, by virtue of the multicultural environment, should be a keen cultural awareness. Ultimately, the study demonstrated that managerial personnel generally lacked the necessary cultural consciousness that could facilitate their acceptance of others' attitudes and views on replacement choices.

In addition, long-term versus short-term orientation is another cultural factor. Hofstede (2011) classified Muslim countries as short-term cultures. Some of his ten differences between short-term and long-term orientation were applicable to the current study. For instance, the finding emerged that the university decision makers were worried about the university's reputation, namely the need to outperform rival organisations, as well as individual managers being driven by similar requirements influenced by the desire to maximise their reputation over a relatively short time period. This was influenced by external pressure from other universities in the region. The university wanted to keep its position as a leading university in Saudi Arabia. Due to the fact that most senior members of departments tended to be on short-term contracts, it was therefore more beneficial for them to implement a system that gave them the opportunity to build their reputation. Nevertheless, it is important to mention that relying on this short-term policy and the fact of staff shortages would lead to crucial organisational and system problems, and to undesired ERP replacement. As reflected in the findings, changing the system for a short period of time without generating a future-oriented model to guide ERP

planning led to ERP maintenance and enhancement problems, since ERP is a long-term process needing knowledge transformation, as well as contingency support.

As a result of the above discussion, all of the factors mentioned earlier can be combined together, taking culture as another underlying factor. For instance, sometimes there is a personal culture when it comes to individuals' interaction with the leadership; it can be an organisational culture when it comes to interaction between decision makers, regulations and the process of replacement; it can be a cultural sector issue, when it comes to the interaction between the process of replacement and the educational environmental elements; and it can be to do with the political system when the process of ERP replacement is influenced by trends and foreigners' involvement. These cultural aspects affected communication and led to the decision makers' misunderstanding of the market and the competition. The cultural aspect also affected the deployment of ERP as well as its development. Thus, culture seems to be another contributor category which impacts on ERP obsolescence in varied ways. The following figure shows the aspect of culture appearing in each identified factor (see Figure 5.3).
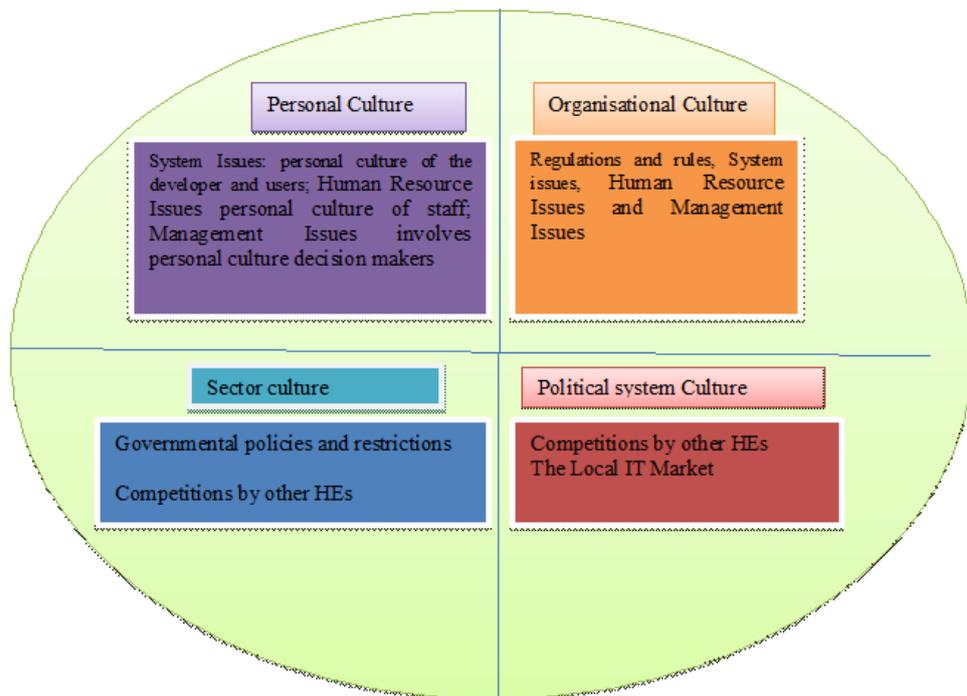

Figure 5.3: Cultural influences on ERP obsolescence decision

As displayed in Figure 5.3, four contrasting cultures were found to have a considerable impact on the decision-making procedure regarding the replacement of ERP in the study

context. In light of this, it is of critical importance to recognise that the decision-making procedure took place in an Arabic environment; this displays a series of dissimilarities when considered in relation to a Western environment. Al Suwaidi's (2008) Master's thesis identified a range of collectivist-oriented qualities that have an impact on the decision-making procedure in an Arabian context and noted that the two prevailing qualities are as follows:

1) National culture: The study demonstrated that collectivist tendencies identified in Arabian national culture influence managerial conduct and governance structures in a range of ways.

2) The emphasis on personal relationships as opposed to agency relationships: This leads to the culturally unique phenomenon of valuing the importance of Wasta (mediation) in key business decisions. Therefore, in the Arabian context, effective business decision-making procedures are closely tied to effective relations among relevant parties.

It is interesting to note that Al Suwaidi's findings emphasise the importance of those of Hills (2002). To be specific, Hills recommended that those in key decision-making positions in organisations ought to factor into account the six cultural layers which influence the communities in which they operate. Hills' (2001) findings were made on the basis of Values Orientation Theory (Kluckhohn & Strodtbeck, 1960), the primary implication of which was that various factors impact individual attitudes, opinions, and conduct: 1) Values based on family context; 2) National cultural values;3) Global cultural values; 4) Occupational cultural values.

In examining the findings that can be drawn from an investigation of contrasting cultural contexts, Hills (2002) noted that the individual differences which are facilitated by such contrasting environments can be used as a starting point to gain insight into the common qualities that people share. The researcher (Hills, 2002, p. 3) provided a detailed account of the common qualities as follows:

1) Physiological: Biological functions of the human body are not culture-dependent.

2) Cognitive: Mental capacities are not culture-dependent.

3) Personal: Emotional responses to certain stimuli are largely similar across cultures.

4) Social: The key example of social aspects of commonality can be seen with regard to the value placed on direct family across cultures.

5) Cultural: A common feature of this is that members of a cultural group have shared cultural norms.

In terms of the political system culture, Wrightsman (1992) saw that individual's values and norms are influenced by the religious as well as political values of the nation. Daniell (2014) states that national cultural factors influence political participation and social solidarity. Such influences explain how and why specific political system cultures are developed in different ways in different countries. Daniell (2014) adds that political system cultures are also influenced by the larger society's values and cultures as well as individuals' cultural values. Hence, Daniell (2014) suggests that understanding Hosfestede's theory of culture and orientation theory culture is vital to understanding how political, management and economic decisions are made across different cultures. In this study, the findings suggested that a complicated interrelationship was identified between different values and norms across Saudi culture and directly influenced the process of making the decision to replace ERP. It is recommended that one studies the nature of such interrelationships before making any further decisions to avoid any further experience of failure of replacement.

5.5 Contributions of this study

At the time when the decision was made to conduct this study investigating the factors of ERP obsolescence in one of the HEIs in Saudi Arabia, there was no awareness that the contribution of this study would be as varied as it has proven to be. What was obvious from the beginning was that the main motivation to conduct the study was to fill the gap in the current literature resulting from the lack of research studies carried out to understand the factors that lead to ERP obsolescence in higher education organisations, namely universities. Nevertheless, the outcomes of this study suggest more theoretical and practical contributions in different areas, namely the creation of a product theory of obsolescence, IS/ERP theory of obsolescence and methodological contributions.

5.5.1   Theoretical Contribution

ERP systems obsolescence is impacted by electronic, non-electronic and human factors. Therefore, the consideration of the obsolescence of ERP systems has a wider scope than focusing on electronic and non-electronic factors. Hence, this study put forward more

explanations of the phenomenon of obsolescence. In comparison to the product obsolescence and IS/ERP literature, the theory developed in this study has shown that the concepts of obsolescence used for product obsolescence characterisation are inadequate. This inadequacy has also been highlighted by recent research (Franciso 2010; Rajagopal 2015).

In terms of product obsolescence, this research fills the gap in this field in different ways. For example, this study has confirmed and extended some of the existing concepts, like planned, economic and environmental aspects of obsolescence. It has also identified new factors, such as organisational, human factors, market forces, postponement or maintenance, and cultural and education system obsolescence, all of which can impact on the obsolescence of products significantly. Previous studies are more abstractive and have not given sufficient focus and importance to these factors and the interrelationships among them. The reasons for this could be attributed to the generalisation of concepts and the abstract nature of these studies, which overlook the importance of the specific factors in product obsolescence. The literature also seems to use the same methods of product obsolescence investigation and lacks sufficient depth, which has resulted in a low level of understanding of product obsolescence (Rajagopal, 2015). A review of the existing literature reveals that obsolescence has been mainly classified and investigated from the perspective of electronic constituents, while the correlation of obsolescence with additional system dimensions (e.g. software, hardware and human resources) has received less attention. Furthermore, the classification in the literature also suggests that obsolescence at the level of the organisation or system has not been afforded the same amount of interest as obsolescence at the level of components. The fact that no other research apart from the present project has adopted a qualitative stance towards this essential domain of obsolescence serves to corroborate the above observations.

In addition, the model of this study could be instrumental in predicting the impact of the different product obsolescence factors and could provide a better explanation of the impact of these factors, and hence it contributes positively to product obsolescence management concepts, which can also be used as a theoretical foundation for project managers, obsolescence researchers, obsolescence managers and software developers to mitigate the effect of the identified issues and help them to develop better plan.

In terms of IS/ERP obsolescence field, firstly, this thesis provides, for the first time, a theory of IS/ERP obsolescence that elucidates different types of obsolescence that led to ERP replacement in an HEI institution. The project also overcomes the existing limitations of LR, which either focuses on a single angle of the obsolescence phenomenon, software or hardware; or else considers the obsolescence from an internal perspective without considering the external influences. This research not only analyses the system as a software package but also examines other management, organisational and cultural perspectives.

Furthermore, the findings also show that the study can be considered as the first to highlight the relationship between the identified factors and how they were influenced by each other and thus made the system obsolete, resulting in its replacement, which also indicates the importance of looking at each organisation's configuration, as each of its components impact on and is integrated with each other. Therefore, this study confirmed the fact that looking at an individual component without taking into account other components is risky and will lead to other organisational factors becoming obsolete, either internally or externally. This research will assist organisations in improving their IS/ERP change management, and their knowledge management and sharing capacities.

Rich information was provided in Chapters 2 and 6 to address issues related to the creation and development of ERP and IS. However, it was found that no previous research studies combined issues related to both IS and ERP in the same depth and comprehensiveness as has been undertaken in this study. The richness of the study has led to a better understanding of the development of ERP and IS, and also provides future researchers with comprehensive information in a single, combined study for the first time In addition, when the decision was made to conduct this study, there was a high level of awareness that existing research into higher education (HE) organisations examining ERP was very limited. Indeed, it proved a serious challenge to find similar studies to compare and contrast with this research for the discussion chapter. Most of the literature on the use of IS/ERP literature in HEIs focuses on the very early stages of the ERP lifecycle; few studies focus on the post-implementation stage and none on replacement or obsolescence. This indicates that the literature gap filled by this study will not only benefit universities in the Arab world, but that it will also enrich the literature concerning HEIs. The need for further research into issues related to the applications of IS/ERP in HE is presented in the conclusion.

From the obstacles point of view, this study is the first to identify management obsolescence in depth and to refer to the influence of layers of culture and the role of management obstacles in shaping the replacement decision. This study raised awareness of the deep influence of the personal culture of managers in making such decisions. As well as decision-making skills, educational background and attitudes were found to have impacted on the process and shaped the decision. Understanding such influences will help decision makers take them into consideration in the future, when further replacement decisions are made. This thesis further confirmed the argument put forward in Chapter 2, that human and organisational problems are always more complicated and difficult to resolve than technical ones. Therefore, there is a need for Saudi leaders and managers of HEIs to become more aware of the crucial impacts associated with the current organisational and human influences, since understanding such influences will enable decision makers to take these factors into consideration when the replacement decision is made, in order to ensure long-term ERP success.

After having conducted an intensive literature review, the author can confirm that this study is the first related to IS/ERP obsolescence in Saudi Arabia. The theory developed concerns IS/ERP obsolescence and replacement and all related issues, and this will be a beneficial contribution, since all universities share the same rules and structure (Awad, 2015). Most of the IS/ERP literature in Saudi Arabia is about adoption and few studies are about post-implementation, since, as stated by the interviewees, such cases were not recorded due to a lack of encouragement from both the internal and external bodies in the organisation. Therefore, this research could be used as a theoretical foundation for Saudi universities to validate the emerged data.

In terms of methodological contribution, involving the practice of GT in this study, the researcher combined this approach with a case study in order to investigate the factors that led to ERP obsolescence in HEIs in Saudi Arabia, as explained in Chapter 2. Most ERP studies have focused on manufacturing and the private sector. The majority of these studies take a quantitative rather than a qualitative approach. However, in the current study, the use of the qualitative approach adds great value to the research findings in the Saudi context in particular, and in the obsolescence field in general. This approach has provided more in-depth information for the specific phenomenon of obsolescence, as discussed in Chapter 4 (findings) and Chapter 5 (discussion).

Although the research methods used in this convergent study were not new, they were combined in ways that has not been undertaken previously. In addition, it can be said that, despite the fact that the literature in the field in the Saudi context included a few studies which had adopted GT, none used second language analysis. Therefore, the reflection and explanation of the coding process, including the use of a list of code definitions, a quotation list, a concept map and a noticeboard in the analysis process, as used here, will assist researchers in this context to understand the nature of the coding process through the use of these tools and the adoption of theoretical sampling, as discussed in Section 3.6.3.1.

However, the adoption of the GT method in such a complex culture was a challenge. This is because GT often involves close interactions with those who contribute their perceptions, opinions and judgements, leading to an understanding of an emergent theory. This interaction very commonly takes place through interviews, focus groups or unstructured discussions. Interviews, in particular, usually involve face-to-face discussion with the participants, guided and often controlled by the interviewer. In most cultures the gender of the interviewer and interviewee has no relevance at all in this process. This is not the case in some Middle Eastern cultures, such as Saudi Arabia. In these contexts, due to the fact that interaction between men and women is carefully prescribed by cultural norms, face-to-face data collection led by women may put them at serious risk and subject to challenges. This is especially the case in the Saudi Arabian traditional public sector, such as in public higher education. Therefore, this thesis can offer a significant contribution, since it provides the reflections of a female grounded theorist who used semi-structured interviews and discussed the challenges and barriers encountered in the data collection process, as well as the mitigation strategies adopted that enabled its success. These strategies may assist academics interested in carrying out research in cultures with gender segregation. Furthermore, they may also be used in research design, and inform interview strategy and data collection in general. It is very important to state that disregarding these context-specific issues can lead to either a complete failure of the research project or to insignificant research findings (e.g. a lack of replies or meaningless responses to questions). Nevertheless, and despite the increasing global academic interest in investigating the Saudi context, there is a scarcity of studies on the issues and difficulties associated with doing research in this context. Therefore, one of the publications arising from this project discusses the contextual research issues experienced in this project, as well as elaborating on the processes

implemented to address these issues. This might help in paving the way towards creating a new understanding of GT in the format of a case study in the Arabic context, namely, Saudi. Thus, it is recommended that a literature review is undertaken to compare the use and practice of GT in the design of case studies in the Arabic context and other GT studies in other contexts.

5.5.2 Practical contribution

According to The Rink et al. (1996), the importance of the research appears not only by clarifying the unknown areas of the research topic, but also by identifying further implications on the social context, the methodological approach, and the context of the study, which will help the researcher then develop a set of recommendations to enhance the practices as well as the understanding. Theoretically, the concept of obsolescence was identified, confirmed and extended in several ways, suggesting that the theoretical implications of these new understandings can be a useful and important contribution for decision makers at different levels, including the Ministry of Higher Education, heads of universities, project managers and managers from different departments, all of whom should consider communication issues when making an ERP obsolescence and replacement decision, paying more attention to human resources and organization studies. This study identified different factors of obsolescence which should be investigated to enhance the practices and the theory of obsolescence, including HR, management and organization obsolescence. For example, this study suggested that decision makers have powerful authority over the process of ERP obsolescence, which suggests that the practical approaches of ERP obsolescence can be varied because they might be influenced by the mentality of the decision makers, as well as their personal culture and educational background. The fact that this study highlights the impact of such power over the decision-making process should make the decision makers aware of the actual role they need to play in the replacement process. At the same time, it is recommended that developing a model for the process of replacements can help in controlling such power in order to avoid any attempt to use that power in a way which is detrimental to the organisation.

Specifically, the developed theory in this research could be used as a checklist to identify, prevent and manage ERP obsolescence and replacement at the current university and other similar contexts. It is important to understand the relationship between the identified issues and it is also important to stress that all the identified factors are not equally important. For instance, governmental and organisational issues

were perceived differently in different organisational contexts and different countries. Additionally, as pointed out by Zhou et al. (2007), the usefulness and value of a checklist, such as the one proposed, "May be questioned if the list is used monolithically and never improved". In truth, Vidalis (2003, p. 20) reinforces the fact that "nothing is… stable in our world […hence] having a generic list is a drawback, unless it is… updated constantly".

The emergent theory does not aim at being a definite and hierarchical set of obsolescence factors. Instead, it is hoped that this theory can undergo a process of re-examination and evolution through practice. Overall, it is suggested that, when using this theory in strategic planning and decision-making, practitioners should select and focus on ERP obsolescence and related issues that are of most concern in their working environment, and continuously improve and refine the lists with real-life experience, without ignoring other issues.

Decision makers and managers who work in the field of providing technology must give sufficient consideration to what IT staff feel and think carefully in advance about any decision to render the system obsolete. The findings will also assist decision makers in universities to learn from the current findings and understand how the IT exclusion decision impacted on the continuity of ERP and its fast-tracked obsolescence, once they deployed the IS/ERP system. It is also important for universities to improve their rules and recognise the influence of the current rules on the success of an ERP system, such as monitoring reasonability, documentation issues, etc. Moreover, it is essential that the decision maker also understands the importance of updating academic staff's teaching style, alongside updating the technological system, both theoretically and practically, in order to minimise human resources issues and the subsequent obsolescence this can bring.

The findings also aim to help decision makers generate better ERP plans, since the data shows that the influence of individual decisions and a lack of communication between internal and external decision makers has a significant influence on ERP obsolescence, leading to incompatibility between different organisational components. It is also important to confirm the availability of resources at the university, to understand the IT market and the applicability of new technology to the university. In addition, it is important to understand the cultural differences between foreigners and locals, as ERP also has its own culture in relation to local and foreign staff and vendors. It is also

important for governments to consider the compatibility of available resources, the policies for recruiting staff, and to ensure the effective development of skills for existing staff in updated technologies when implementing their IS plan, in order to avoid premature system obsolescence. This research can help the government to rethink its education system and its relationship to staff skills and organisational development. It also indicates the importance of governments encouraging managers in organisations to share their experiences with other universities through publications. As one of interviewees stated, "*We are living in an environment where they do not record their experience so others can share and learn; that is why we are always behind. The mistakes will be repeated all over again when applying any IS system*" (N1, DM1). Thus, this research will benefit the Saudi government, who can force the universities to share and record their experiences in order to save the system's life and budget.

Moreover, perhaps the most interesting part of this study is related to the context, where the local culture of HEIs in Saudi Arabia appears in the findings to suggest that different types of cultures influence the process of ERP obsolescence in different ways (see Figure 5.3). This element of the finding can have serious implications, not only regarding understating the ERP replacement decision, but also in terms of how specific cultures can shape any decision. Therefore, it is suggested that further investigation of the possible implications of different cultures on obsolescence decisions would be useful.

The findings also provide a better understanding of software obsolescence and the interrelationship between it and other cultural factors, which benefit **ERP vendors** in terms of producing and designing commercial software packages, as they could make sure they understand and monitor all aspects of involvement with Saudi culture and public organisations that might impact on whether the system continues to be purchased.

5.6 Conclusion

In this chapter, the integrated model which emerged in this research project has been compared to three different areas of obsolescence literature, namely the existing general product, IS and ERP obsolescence models. Also, this chapter has identified contributions to the existing body of knowledge in these different areas and has linked the research findings to the reality of practice.

The next chapter, Chapter 6, concludes the research project, providing a brief summary of the answers to the research question that have been derived from the research findings, pointing out the study's limitations and identifying areas for future work.

Chapter 6: Conclusion

The purpose of this chapter is to conclude the thesis by summarising the research journey that aimed to investigate the factors behind ERP obsolescence in one of the HEIs in Saudi Arabia. The chapter starts by providing answers to the research questions, and then highlights the limitations of the research and reflects on the study. Finally, recommendations for future work are presented.

6.1 Responding to the research questions

In the introductory section of Chapter 1, the main research aim for this research project was to investigate the factors that contributed to ERP obsolescence in HEIs. One large university in Saudi university.

In order to respond to this main research aim, three main research questions which are derived from the main research aim.

1. What are technical and management staff perceptions of ERP obsolescence in a Saudi HEI?

2. What are the factors that influence the perception of ERP obsolescence in HEI in Saudi?

3. How can these factors be integrated into a theory of ERP obsolescence in Saudi HEIs?

Each of the above research questions will be addressed and discussed individually.

Question 1: What are technical and management staff perceptions of ERP obsolescence in a Saudi HEI?

'Perception' is defined as the way something is regarded, interpreted or understood by human beings. Therefore, there is a subjective element in seeing or understanding the factors and elements that enter into a decision process. Measuring the perspectives of human beings in relation to something is inherently complex. This research study attempted to group and characterise all the obsolescence factors relating to ERP systems objectively. Based on Grounded Theory (GT) guidelines and principles, a set of categories and sub-categories of obsolescence factors emerged from the study, in which the perceptions of ERP system obsolescence in Saudi HEIs can be interpreted as being either externally or internally driven. Externally driven perceptions can here be defined as any perceptions that are driven by factors outside the HEI's control, whereas internally driven perceptions are any perceptions that are driven by factors within the

HEI. Given the broad meaning of the external and internal categories, it was necessary to distinguish these into sub-categories.

This study has identified differences in the perceptions of obsolescence factors between management and technical staff. Although both groups share the same perception drivers, this may not lead to the same conclusions being reached. In particular, the importance given to an obsolescence factor varies significantly between the two groups, as discussed in detail in Chapter 4. This research study demonstrates the importance of group perceptions, interrelationships and opinions. The opinions and perceptions of a particular group, the dominant group, in some circumstances may outweigh the opinions and perceptions of other groups. This dominance may lead to the exclusion of other groups' perceptions and opinions from the obsolescence or replacement decision-making process. The impact of grouping and differences of opinion on obsolescence is therefore significant. Specifically, the obsolescence decision can go either way: i.e. either to replace the system or to keep and evolve the current system. One aspect of group exclusion is that it may result in decisions being made on system obsolescence with high rates of false positives or false negatives. This research study showed a conflict of opinion between management and IT staff, with the management's opinions and perceptions being dominant. This group dominance, in turn, led to the exclusion of the IT staff from the replacement decision process and hence their opinions were not taken into account. The replacement decision could have been different if the dominant group was the IT staff.

From an internal perspective, obsolescence is perceived as an issue related to one of the following main categories: System Obsolescence; Organisational Obsolescence; Management Obsolescence; and Human Resource Obsolescence;

From an external perspective, the following issues have been identified as the main drivers that shape the opinions and obsolescence factors that influenced the obsolescence and replacement of the ERP system: Governmental Policies and Restrictions Obsolescence; Competition Obsolescence; and Local IT Market Obsolescence.

The above two sets of obsolescence issues constitute the main categories of ERP obsolescence perceptions. They emerged as a result of applying GT principles to the collected data (Section 3.6.3). Each of these categories has emerged as a shared meaning for its sub-categories and concepts. The coding process used in GT analysis

reliably resulted in a set of concepts and categories that are distinguished from each other and comprise categories that have clear and understandable relationships with each other (Section 4.1).

Question 2: What are the factors that influence the perception of ERP obsolescence in HEIs in Saudi?

ERP obsolescence in Saudi Arabian HEIs is affected by a complex web of influencing factors. Each factor contributes its share, small or large, to the overall ERP obsolescence. Factors that have a small influence might be overlooked and even ignored; however, their influence can combine with other factors and become a significant factor that leads to ERP obsolescence. The different influencing factors have clear relationships with the different types of ERP obsolescence; however, the relationship of the individual factors to the overall ERP obsolescence may not be so clear. Grouping the individual influencing factors into obsolescence factor groups and associating them to their ERP obsolescence type makes their relationship to the overall ERP obsolescence clear and their influence understandable.

As explained previously, seven main categories have emerged. Further to this type of obsolescence, different technical and non-technical factors that contributed to ERP obsolescence in Saudi HEI were identified. Due to the varieties of these factors, in order to present them in a clear way, the researcher illustrated them according to the sequence of the identified seven categories as follows:

System Obsolescence:

- Network issues (e.g. some files and documents cannot be attached);
- Legacy-based issues (e.g. other legacy systems are not compatible with the previous ERP system);
- Maintenance issues (e.g. inadequate maintenance);
- New system advantages (e.g. new system popularity; saving time and effort);
- Integration issues (e.g. not all modules are deployed at the same time).

Organisational Obsolescence:

- University business process changes (e.g. connection with external stakeholders);
- Documentation issues (e.g. lack of official documents in current context);
- Reporting issues (e.g. reporting delay);

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- Pressures on university (e.g. increase in size);
- IS implementation issues (e.g. lack of internal governance to control IS implementation).

Management Obsolescence:

- Top management influence (e.g. professional role not described);
- Decision-maker issues (e.g. decision-makers' educational background);
- IT staff responsibilities (e.g. pressure on IT staff).

Human Resource Obsolescence:

- Skills and knowledge not updated (e.g. local IT staff exclusion);
- Professional specialist unavailability (e.g. lack of qualified internal and external Saudi staff).

Governmental Policies and Restrictions Obsolescence:

- Governmental policy issues (e.g. rules and regulations related to hiring foreigners);
- Educational system issues (e.g. ERP not yet introduced as a subject);
- Economic issues (e.g. significant impact of university budget).

Competition Obsolescence:

- Partner influence (e.g. competition with private universities in applying latest IT technology);
- Consultant influence (e.g. contractual problems);
- Vendor issues (e.g. prevalence of global brands in vendor market).

Local IT Market Obsolescence:

- Private-sector issues (e.g. the complicity of roles and regulations);
- Public-sector issues (e.g. Private sector reward mechanism).

Overall, it can be observed from the above that the obsolescence factors are not only related to one type of ERP obsolescence but to multiple types. Discrete types of obsolescence can combine together to make the ERP system obsolete despite the fact

that, taken individually, it may not point to this conclusion. Hence, it can be seen that obsolescence factors are not only related to technical issues, as research studies frequently suggest, but that other problems can trigger ERP obsolescence. These can be rooted in organisational and human-related issues, including top management issues, those of IT experts and other external aspects in the context of Saudi HEIs, rather than merely in technical areas. This conclusion thus reinforces the argument made earlier in the introductory chapter, indicating that simply investing in further technological solutions may neither help companies to address their organisational and management problems nor prevent ERP obsolescence before its time, since there are still various components of obsolescence factors in the organisation that may lead to ERP obsolescence. Thus, understanding these obsolescence factors is of high importance not only about extending the overall ERP system's life but also to reduce the obsolescence of the parts that compose its software and organisational components.

Question 3: How can these factors be integrated into a theory of ERP obsolescence of in Saudi HEIs?

ERP obsolescence is a complex phenomenon and can be affected by many factors, including technical and human factors. The emergent theory emphasizes the importance of considering obsolescence factors as contributors to different types of ERP obsolescence, in particular that an individual obsolescence factor can have multiple but direct relationships to different types of ERP obsolescence. Identifying these obsolescence factors is critical to the whole ERP obsolescence theory. Finding these factors is made relatively easy by following the emergent theory model (Section 4.1). The model takes a holistic view of the ERP obsolescence phenomenon. Overall ERP obsolescence is conceptualized with the broadest internal and external categories that have clear and meaningful relationships to the different ERP obsolescence types (Figure 4.17).

As emerged from data, the seven main categories are closely related and interact with each other. ERP obsolescence overlaps both internally and externally. External factors (EEOs) lie outside of the control of organisations, while internal factors (IEOs) are potentially within the orbit of control of organisations. It is clear from the model that ERP obsolescence can occur as a result of either one of the two obsolescence types occurring. Hence, an EEO means that very little that can be done by the organisation to rectify the outcome of the ERP obsolescence phenomenon, but an IEO type may be one

which the organisation can intervene in and rectify, thus maintaining the ERP system's life.

In addition, the emergent theory shows the importance of the identification of all the obsolescence factors alongside the relationships between these factors. To be more specific, and as shown in Figure 4.17, there are two kinds of arrows that illustrate the connection between categories. The category of system obsolescence is related internally to organisational obsolescence, human resources obsolescence and management obsolescence by a single arrow. Similarly, management obsolescence is connected internally with organisational obsolescence, human resources obsolescence and system obsolescence and externally with political obsolescence. However, both system obsolescence and management obsolescence are not connected with competition obsolescence and local market obsolescence. Therefore, any single factor may not lead directly to ERP obsolescence and many combinations of some of these factors may also not necessarily lead to replacement either. Rather, some factors, especially when combined with other specific factors, can have more weight in the replacement decision. For instance, government policies in the current context described in this thesis are very influential, and when combined with the short-term contracts of managers can decisively lead to obsolescence and therefore to ERP replacement (as explained further in Section 4.4), in a way which no other combination of factors is likely to generate. Nevertheless, the significant impact of certain dynamic combinations of factors is ultimately context-dependent, and no weight of pressure is absolute, and therefore, no outcome inevitable. Thus, these factors in a Western institution at the current time would be less likely, by themselves, to be decisive in the ERP replacement decision-making process.

Therefore, understanding these types of relationships is critical to both ERP obsolescence and replacement theory and its intended organisational environment, in terms of avoiding a mismatch between them, thereby leading to undesirable outcomes, such as unnecessary replacement. Since the replacement of software requires new hardware and staff to match with the system, even if those components work functionally and effectively, organisations should take this into consideration by identifying these factors and areas of obsolescence in order to take early actions to avoid the continued replacing of ERP and the subsequent waste of resources involved, when the system remains functional. In addition, it can provide a better plan for organisations when introducing new software.

The emergent theory model is the result of the GT methodology adopted in this research study. GT generated sets of codes, concepts and categories, as well as their interrelationships have been scrutinised. ERP obsolescence, as a core category (CC), emerged to form a relationship between two main subcategories, namely Internal Environmental Obsolescence (IEO) and External Environmental Obsolescence (EEO).

During this research project, it has become clear that the use of different tools (including a coding definition list, quotation list and concept map) throughout the analysis process has been particularly useful for the practice of open and axial coding, in which a code can be clearly represented, in terms of both its meaning and where it should be positioned. Then the theory was reformulated with a smaller set of higher-level concepts, once the coding categories emerged, the next step being to link them together in theoretical models around a central category of system obsolescence, which is considered to be a central phenomenon related to all other categories. Therefore, the root definition of ERP obsolescence was perceived and saturated in terms of two main categories. After the obsolescence influencing factors were conceptualised, the main categories began to emerge and the whole categories and sub-categories were saturated; then the central phenomenon appeared as system obsolescence.

The next phase involved comparing the emergent categories of this study to the existing obsolescence models and ERP replacement in the literature. A number of emergent category meanings and definitions were confirmed by examining the current literature. However, the meanings of some of the existing models' categories were extended, in order to include some of the emergent obsolescence factors from the current study. In addition, entirely new categories of obsolescence types have also emerged from this study as a result, of applying GT principles to the collected data (Sections 5.2, 5.3 and 5.4). Each of the categories emerged as the shared meanings of its sub-categories and concepts. The coding process used in GT analysis reliably results in a set of concepts and categories that are distinguished from each other and also results in categories that have clear and understandable relationships with each other (Section 3.6.3). However, after comparing the findings of this study with the current literature, which is mostly Western literature, the outcomes show that a cultural element contributed to ERP obsolescence, which is considered to be a new contribution in this field.

The emergence of ERP obsolescence theory in this research adds a layer of ERP obsolescence and its different types to the theory of ERP replacement in the current

body of knowledge. Thus, it shows that these factors do not directly or simply lead to replacement but lead to different types of obsolescence over time, which eventually pushes organisations into replacing their existing ERP system.

In brief, ERP obsolescence can occur due to a complex web of influencing factors that can be outside or within an organisation's control. Organisations can take action to rectify the factors that lead to ERP obsolescence when these factors are within their control. The generated theory model has easy to understand relationships among its components and is extendable through the inclusion of existing and newly identified ERP obsolescence types. It gives different perspectives that can aid both management and technical staff alike in determining problem areas, and hence reduce the efforts and costs involved in the continuance of the ERP system. Furthermore, with the generation of these findings and conclusions, this research study has made very significant contributions to both the theory of and practice in ERP systems, as discussed in Section 5.5.

6.2 Research limitations and the choice of mitigation strategies

As expected, this study is subject to certain limitations that may affect the validity of the findings. These limitations can be grouped and delineated as follows:

The chosen research methods represent the primary limitation in this study. This research project adopted GT as the overarching research methodology to guide the analysis of data collected in a single case-study design. Thus, as emphasised by Yin (2003), issues of generalisability must be acknowledged, as it is not usually possible to make generalisations on the basis of a single case study design. The idea that relevant generalisation based on knowledge from just one case study is impossible can be counteracted based on two reasons. The first is that, even if it cannot be generalised, knowledge from a case study is still significant and can contribute to the wider pool of knowledge; the second is that it is possible to generalise based on knowledge from a single case study, with the purpose of promoting scientific progress (Silverman, 2005). Therefore, the reason for choosing this particular case was that a large, old, leading public university that had used a different ERP system for more than 5 years, and had strong governmental support in terms of higher budget availability than other universities, and more staff, students, departments and faculties. Furthermore, in this case study, where the phenomenon of ERP replacement happened and appeared, the researcher understood the importance of these critical issues in IS, and the need for a

deep understanding and exploration the activities and factors in more detail. Moreover, the time and resource restrictions also make this approach seem reasonable. According to Ragin (1992), generalisation from a specific case is possible, provided that the case advances comprehension of key aspects or extends thorough clarifications. Furthermore, a case study will be advocated by most academic researchers if the intention to generalise is clearly stated (Denzin & Lincoln, 2000). As regards the current research, the chosen case is believed to help to better understand the research aims, given its features and setting.

GT, along with several other quantitative methods, is often regarded as inadequate when it comes to generating generalizable results. According to Strauss and Corbin (1998), the GT method is deigned to generate a substantive theory on the basis of a single area of research with a specific population group. This substantive theory can be applied to explain the characteristics of a specific group and can only be generalised in terms of the specified population (Strauss & Corbin, 1998, p. 267). The present study formulated a substantive theory based on the analysis of a single case study and did not attempt to apply the findings to a more general population. Further still, in social science, as opposed to natural research, generalisation is quite complex. For instance, Bassey (2001) argues that social researchers are generally required to work with limited data that is subject to a significant number of influencing variables. As such, valid generalisations in the field of social science are difficult to make. For example, while a teacher may deliver what appears to be the exact same lesson to two different classes, the outcome of the lesson may vary, depending on contextual or environmental variables. Thus, it is simply unfeasible to make probabilistic generalisations on the basis of a class delivered several times. In order to address this issue, Bassey (2001) advocates the formulation of fuzzy generalisations, which means that the outcome of one study is used to anticipate as opposed to determine the outcome of another. This being said, the generalisability of the present findings can be enhanced through future research in this area.

While the limited generalizability of the findings has been acknowledged, considering the complexity of the field of social science research, the present findings may indeed be considered somewhat representative of other HEIs in Saudi Arabia. As many universities throughout the kingdom adopt a similar data flow architecture and business structure, and are subject to similar governmental or managerial regulations (Awad,

2014), the findings can be applied to other HEIs in Saudi Arabia but not to overseas institutions. Nonetheless, the results can be considered transferrable and should stimulate further research on this topic in different contexts. In addition, the findings in relation to the relationship that exists between ERP replacement factors in Saudi HEIs may be applied to assess additional public services that employ similar policies throughout the kingdom.

This study uses interviews as the single data collection instrument, which limits the validity of the results, as no evidence on how the previous system was deployed has been collected from documentary sources, employees or online information. Thus, additional data will generate more insights into the practice of ERP replacement.

According to Beach and Connolly (2005), the decision-making process is regarded as a social as opposed to solitary practice. In effect, the use of focus group interviews may have generated more insightful results. Nonetheless, a focus group in this case was not conducted due to logistical issues, time management issues and an inability to utilise video conferencing technology on account of cultural and governmental policies. A focus group can also often be hindered by a lack of trust within the group or the discussion of a topic that is overly sensitive. Thus, interviews were held over the phone for the purposes of the present study and the effectiveness of this approach will be discussed in the following section. As a result, as mentioned in Chapter 4, the focus group instrument was not chosen as a contender for the data collection method.

There are also limitations with regard to studies of decision-making as a cultural phenomenon, as they primarily depend on self-reported data that may lead to confusion in determining participants' thoughts, attitudes and actions (Twati, 2006; Ockene, 1997). For instance, the researcher observed that some of the participants attempted to answer interview questions in a socially acceptable manner, as opposed to conveying their own true feelings on the topic. As a result, it was imperative to isolate the findings that may be considered generalizable by identifying the differences and similarities in the data provided by decision-makers and IT personnel. This process also ensured the validity of the results.

This study is also limited by the fact that the researcher was reared in a social context that is remarkably similar to that of the research site. As such, while personal knowledge and experience facilitated the researcher in protecting the dignity of participants, it was also difficult to analyse and interpret the findings without allowing the influence of prior experience to compromise the researcher's objectivity. As a result, a coding definition list was employed along with a concept map and quotation list to facilitate data analysis and maintain objectivity. The application of these methods is detailed in Chapter 4.

In addition, this project was performed by a single researcher and the definition and identification of ERP obsolescence thus depends on the researcher's personal academic and practical interpretation of the topic. This being said, the researcher took measures to ensure that her data collection, analysis and interpretation methods were appropriate, especially considering this was the first qualitative research project she had undertaken. To mitigate the possible negative implications of this limitation, three key measures were taken, the first of which involved regular consultations with the researcher's supervisor, who is an expert in the field of qualitative research and well-versed in the application of Grounded Theory. These consultations enabled the frequent discussion of the findings and evaluation of the coding, analysis and conceptualisation process. The second measure was to discuss the findings with peers and other academics on an ongoing basis through research seminars held by the Information School's Information System Research Group. The researcher also composed academic papers and posters on the findings which were published in and presented at international academic conferences.

6.3 Reflections on the data collection process and analysis

Reflection is a learning process, conducted at the last stages of a research study, and it is one of the best methods of enhancing a researcher's reporting skills and knowledge. In this process the researcher looks back over to what have been done throughout the research process. It helps the researcher to get to know herself better as a learner, a thinker, and a community member. This reflection, also, provides important feedback for future researchers and to their peers. It generates questions and ideas that would accelerate and propel future research work and learning experiences.

Myers and Newman (2007) illustrated different qualitative interview challenges, including interview accessibility, trust, time constraints, sampling, interview design,

interview skills, terminological ambiguity and intrusiveness. Therefore, this section considers the researcher's reflections on the experiences of the process of approaching interviewees, including interviewees' accessibility, gaining trust, conducting interviews and terminological ambiguities.

- interviewees' accessibility

The process of obtaining the provisional agreements for conducting interviews with the purposely selected participants was very demanding and challenging to say the least. It required a great deal of time, planning and alternative strategies in cases of failure to access the required participants. Gender issues emerged during the very early stage of the process of gaining access to participants. Due to cultural restrictions and public sector institutions; policies on gender, the researcher was not able to gain direct access to male participants initially. With female participants, gender was not an issue, however.

To alleviate the issues associated with gender accessibility, different approaches were adopted. Social factors, such as parentship constructs in the Arab world have a great importance. The researcher was able to use such factors to her advantage in gaining access to the male participants directly. Parentship and power distance constructs together played a significant part in achieving this direct access. By overcoming this access hurdle, the researcher was then able to communicate with the selected participants in order to seek their willingness to participate in this research study.

- Gaining trust

Openness, engagement with the research and trustworthiness are essential factors in qualitative research studies. Contacting participants in a professional manner is very important and a significant element in gaining the interest of the selected participant in the research project. This professional way of approaching the participants also helped to increase the trust of the participants in the research aims and end goals.

Interview techniques and skilfulness in conducting interviews are the most important elements in securing openness and engagement in the research study. It is helpful to gain some knowledge about the participant's interests and their backgrounds before conducting or even selecting the participants. The researcher found that a check on participant profiles on the institution's website, and the social media profiles of the participants on LinkedIn and Twitter, were very helpful in giving the participants' interests and in deciding on their appropriateness for engagement in the research study.

It helped to delineate initial common interests, in this case on ERP systems, between the researcher and the interviewees. Another factor worth mentioning here, is that, in the Middle Eastern culture, professional titles should be used in addressing and communicating with participants all the times. The participants in this study had high qualifications levels and skill sets from highly reputable institutions. Having an equally high degree from a western university helped the researcher to gain more trust, involvement and participant engagement. The participants showed great enthusiasm and interest, and valued the research study aims and goals highly.

- conducting interviews

As maintained by Corbin and Strauss (1990), a context has to be explored from the perspective of conditions wider than those of immediate relevance to the matter under investigation. The authors suggested such wider conditions to encompass, among others, economic, cultural, political and social conditions.

A key insight from this project is the need to consider the additional layers of complexity involved in undertaking research in a different cultural context; for example, the gender segregation practiced in Saudi culture prohibits women from entering a male department, and consequently prevents a female researcher from conducting face-to-face interviews with men. To overcome this problem, the researcher used telephone interviews. Block and Erskine (2012) have observed that using telephone interviews as a means of data collection has increased in popularity. However, various scholars have criticized the use of this method for qualitative data collection (Gillham, 2005; Legard et al., 2003; Rubin & Rubin, 1995 as cited in Irvine et al., 2012), on the basis that the absence of face-to-face conversation would have an impact on building rapport, as well as the creation of a 'natural' atmosphere.

Despite these criticisms, there are benefits to using telephone interviews, such as time saving and reduced travel costs; 50-75% in savings has been estimated when compared to face-to-face interviews (Marcus & Crane, 1986; Worth & Tierney, 1993 as cited in Block & Erskine, 2012). In the case of this study, interviews were conducted during Ramadan (the month of fasting) which coincides with the summer holiday period in Saudi Arabia. Knowing this, the researcher pre-contacted potential respondents via email to check on their availability during this period. This approach had two key benefits: firstly, it enabled the researcher to effectively manage her time during the

project and allowed respondents to set aside time according to their availability during this busy period.

Secondly, because women very rarely deal with men in the public sector in Saudi culture, and men are usually segregated from women in the work environment, physical face-to-face interviews between a female researcher and male respondents would be impractical. In view of this, the telephone interview methodology was used, because it put respondents at their ease and they felt freer to express their thoughts and opinions. Nonetheless, a significant difference in responsiveness between interviewees who had degrees from overseas institutions and interviewees who had local degrees was evident, in that those who had studied overseas were more open to conversation than those with a local educational background. The reason for this is understood to be that studying abroad allowed these respondents to come into closer contact with women than was permitted in Saudi Arabia, and consequently they were more comfortable interacting with a woman in a working environment. It was therefore critical for the researcher to understand the constraints of this cultural variation and make allowances for the differences in willingness to respond, by adapting the style of questioning to avoid defensive responses.

One other aspect related to defensive responding was found to be directly linked to the high Power Distance Index that characterises Saudi culture. Often the managers and IT staff interviewed attempted to respond in ways that would show their allegiance and loyalty to the deans who had encouraged them to participate. As this study was researching sensitive issues, participants in some places tried to avoid answering questions or tried to change the direction of the conversation. In order to try to overcome these issues, data analysis was performed immediately after the interviews. As the project progressed, the questions were refined and rephrased to try to find indirect ways of getting respondents to talk about what was worrying them. In addition, the anonymity of their responses was stressed, as this is an important factor in telephone interviews covering sensitive topics (Chapple, 1999; Kavanaugh & Ayres, 1998; Sturges & Hanrahan, 2004 as cited in Irvine *et al.,* 2012). In this research project this strategy worked well by increasing the amount of information provided, and for this reason most of interviews ran for one and half to two hours. Thus, it was not uncommon for detailed qualitative data to be collected by telephone interview.

- terminological ambiguities

Given that a proportion of participants were Arabic native speakers, interviews could not be carried out in English. To avoid impacting on the collected information's robustness due to the language barrier (Marshall & White, 1994), Arabic language interviews were held by translating the interview script. Obstacles thereby arose relating to the precision obtained after translating English-Arabic (script) and Arabic-English (responses), but these were considerably mitigated, given the interviewer's bilingual proficiency.

One way to overcome this would have been to formulate an Arabic language interview script. Nevertheless, to guarantee sufficient theoretical sensitivity, as recommended by Strauss and Corbin (1990), English language literature was used for initial research. Resultantly, terminological features and the interview script were designed in English.

Furthermore, given the research's location in a UK-based institution, producing an English interview script was the natural option (Peng & Nunes, 2008). The effectiveness of qualitative research is directly linked to the accurate formulation of a data collection tool, and this is further dependent on grounded theory's general construal as a cooperative procedure (Corbin & Strauss, 2009). Cooperative activity of this kind is critical in avoiding prejudicial attitudes, generating novel perspectives, and enhancing theoretical sensitivity (Corbin & Strauss, 2009), so this further justified English as interview script's design language. Completed scripts were translated into Arabic with due attention (Peng & Nunes, 2008), acknowledging that imprecision invariably leads to impaired information reliability and validity (Carlson, 2000).

For translation purposes, language- and culture-based diversity should be carefully acknowledged (Carlson, 2000). Particularly important is to bypass direct literal translation, which inevitably leads to ambiguity (Peng & Nunes, 2008).

As manifest conceptualisations in one language can be uncertain in another, Carlson (2000) notes that an important language- and culture-based obstacle relates to 'emic' and 'etic' concepts. This is relevant for the English-Arabic component of this research. Pratt (1991) notes that Western 'emic' terminologies, including 'individual differences' and 'self-concept', can only be problematically translated as, in a different cultural context, they are not equivalent. Thus, rather than literal equivalence, conceptual equivalence must be central when translating (Harkness & Schoua-Glusberg, 1998;

Carlson, 2000). Attention to this will heighten the reliability of the collected information (Peng & Nunes, 2008).

English-Arabic translation could be facilitated internally with the bilingual lead researcher, and for technical terminologies associated with ERP, Arabic language sources were consulted. Alterations were made following a pilot study with a sample of Saudi-based scholars.

The interview script's improvement, taking place gradually following interviews, was characterised by iteration given the interconnected nature of changes. Modifications were comprehensively evaluated across trigger and follow-up items to mitigate against potential ambiguities.

To carefully examine and rephrase every item, the researcher ensured a phrase's semantic content by validating responses with supplemental explanations in script items. A comparable process featured over the evolution of the script as the process progressed.

- Interview transcript translation

Translating collected information can be more difficult than translating a data collection tool, given the wealth of content the former contains, and Twinn (1997) warned against the possibility of losing information in translation. Consequently, it was determined that Arabic would be used for data capturing, coding, and analysis, and English would be used for reporting on the findings and providing quotable material in the formal writeup. Two benefits stem from this:

a) Translation can create problems, due to the absence of linguistic conceptual equivalence and translator bias, thereby leading to impaired data reliability and validity (Carlson, 2000; Twinn, 1997, 2000). The minimisation of these concerns was facilitated with the adopted approach.

b) Translating participant responses before analysing them inevitably severs the association between information gathering, analysis, and interpretation. This is particularly pertinent given the dynamic connection between gathering and analysis in qualitative studies, which is not present in quantitative studies (Esposito, 2001). Additionally, an analysis conducted after translation suffers from its inability to consider tone, gradation, and nuance (Marshall & White, 1994). Thus, rather than fully translating interview transcripts, coding was

facilitated in Arabic; having determined codes, categories, and subcategories, excerpts were chosen for Arabic-English translation, thereby ensuring error minimisation and mitigating against potential information misunderstandings. Ultimately, this enhanced the information's quality and the viability and reliability of the findings.

6.4 Future work

This research study suggests eight recommended areas for further exploration. Since Saudi culture differs from western culture, in many aspects, it is to be expected that such contextual differences may result in different ERP obsolescence factors; thus, cultural difference emerged as an additional but meaningful area for further investigation and exploration, in terms of the transferability of these research findings.

Furthermore, the emergent theory could be tested for applicability and generalizability in other forms of HEIs in Saudi Arabia, like private universities. It could also be used to test the applicability and generalizability in other public sector organisations in Saudi Arabia. The Kingdom of Saudi Arabia sees education as a fertile land for educational research, and, bearing in mind the differences between public and private HEIs in the country, findings from this study could be used in comparative studies. For example, the emergent theory that explains relationships between factors can test whether these institutions have the same or different factors in relation to ERP obsolescence in Saudi Arabia, since the governmental regulations and size are different in each case.

The substantive theory generated in the study also can be expanded and generalised, though only to similar regions, company types and sectors as the ones studied. For this type of future work, the research findings of this project can be used as a theoretical foundation. Further studies investigating cognitive and motivation biases in such research are recommended, in order to investigate the influence of these factors involved in IS/ERP obsolescence.

Moreover, this research has focused on identifying and exploring the phenomenon of ERP replacement. However, due to the time limitation of the project, it does not develop or provide detailed solutions and recommendations on how to resolve and mitigate each identified ERP obsolescence factor. This certainly represents a clear and important direction for future research. Specifically, further research work should be carried out to identify and establish strategies and action plans to help organisations to manage and mitigate the factors that currently impact on by IS/ERP obsolescence.

In order to successfully replace the ERP system or any IS system, future work could explore the impact of change management process and its factors in IS/ERP obsolescence on the basis of the identified factors in this research and how they are interrelated in terms of making each other obsolete. In addition, the model employed in this study may provide an instrumental means of predicting the impact of different product obsolescence factors and better explanations of these factors' impacts, and hence contribute positively to product/ERP obsolescence management. Finally, future work could investigate the applicability of these research findings to hardware obsolescence.

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Appendices

Appendix 1: Interview script

Interview script

Introduction

My name is Arwa Aljohani. I am a PhD student in the Information Systems research group at the Information School of Sheffield University. My current research is under the supervision of Dr. Alex Peng and Dr. Miguel Nunes.

I would like to invite you to take part in this interview which aims to identify the factors that lead to ERP replacement in Higher Education and will hopefully assist in improving decision-making in this context, both in general and in Saudi universities specifically.

Referring to the introductory email which was sent earlier, stating that all data gathered at this interview will be completely anonymous and treated confidentially, I just want to confirm that your name will not appear or be reported in any documents, further research or publications. The recorded audio will be transcribed and only transcribed data will be accessed for this research study, and by the same researcher in further studies, if you have already agreed to this.

Since your decision to participate in this study is voluntary, you are entirely free to decline to answer certain questions, or to halt the interview at any time.

Please read the information sheet and consent form which was sent earlier and then sign the consent forms, if you are willing to do so. I just want to reiterate that, even after you have given consent to be interviewed, you still have the right not to answer questions or to halt the interview at any point.

[2 minutes for this]

OK, thank you. Are you happy for me to turn the recorder on now? Are you ready to start the interview?

Do you have any questions before we start?

Section A: General back ground

A1. What are your main responsibilities in your department?

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A2. What is your understanding of ERP system in the university?

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Follow up questions:

    a.   Were you involved in the previous current ERP implementation?

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    b.   How would you use ERP in your current position? (optional)

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Section B: Original ERP version vs. New ERP

B1. How do you feel about the original ERP?

Follow up questions:

a. How useful do you think the old ERP was?

b. What was the performance of old ERP? / Did the old system meet your expectations or requirements after its implementation? (Can you give me more examples, please)? If no, why did not this system meet your requirements?

B2. According to your knowledge how many ERP systems have been implemented in the university? Has the old system been replaced by new one? And why do you think the system has been replaced recently?

C2.1. Regarding the ERP replacement decisions, what role did you have in the ERP replacement decisions? Would you categorise yourself as a decision maker, information provider or both?

Follow up question:

(A) If Decision maker:

A1. Who else was involved with the decision-making process? Why did you choose him /her?

A2. How was the decision made? Was the old ERP system ethically reviewed first? Were the previous mentioned factors fully considered and explored? If no, why were they not considered?

A3. What do you think about the decision-making process? How could it have been improved?

A4. What impact do you think your opinions and knowledge had on the final decision?

(B) If information provider:

B1. What do you think about the decision-making process? How could it have been improved?

B2. What impact do you think your opinions and knowledge had on the final decision?

B3. Would you like to be involved in the decision-making process or not? Why?

(C)If both (decision maker and information provider):

A1. Who else was involved with the decision-making process? Why did you choose him /her?

A2. How the decision was made? Was the old ERP system ethically reviewed first? Were the previous mentioned factors fully considered and explored? If no, why

A3. What did you think about the decision-making process? How could it have been improved?

A4. What impact do you think your opinions and knowledge had on the final decision?

Section D: ERP replacement decision making

C1: Identifying factors that led to ERP replacement in HEI

What are the main factors that influenced the ERP replacement decision, do you think?

Potential sub-questions: if organization,

➢ Do you think that the organizational factors influenced ERP replacement? If so, what these factors are?

Potential sub-supplementary questions:

- ➢ Do you think that the ERP replacement was influenced by the misfit between ERP systems and organization structure? If so, could you explain how it affected?

- ➢ How about the organization roles, do you think these influenced the ERP replacement in the university? If so, how?

- ➢ Do you think that the ERP replacement was influenced by the individual responsibility and their skills? If so, could you explain how?

- ➢ Do you think the ERP replacement was related to financial issues? If so, what are there?

Potential sub- questions: if system,

- ➢ Do you think that system factors influenced ERP replacement? If so, what were these factors?

    Potential sub-supplementary questions:

- ➢ Do you think the ERP replacement was closely related by technical infrastructure factors? If so, what were these?

- ➢ Do you think the ERP replacement was influenced by the limitations of systems functionalities factors? If so, what were these?

Potential sub-questions: if external environment,

➢ Do you think that the external factors influenced ERP replacement? If so, what were these factors?

Potential sub-supplementary questions:

➢ Do you think there was any influence from external pursers that affected the ERP replacement? If so, could you explain how?

➢ How about the environmental and national policies and their responsibility, do you think these influenced the ERP replacement in the university? If so, how?

➢ Do you think that the ERP replacement was influenced by the vendor issues? If so, could you explain how?

➢ Do you think the ERP replacement was related to financial issues? If so, what were these?

Close up questions:

➢ Do you think any other factors influenced the ERP replacement decision? If so what were these?
➢ Do you think anything else was, related to ERP replacement??

Sub-category of Organisational Obsolescence		
Sub-categories	**Codes**	**Definition of codes**
Pressure on university	Need to change technical environments	There was internal and external pressure on the university to change the technical environment to match the trend of information technology.
	Remaining as leading national university by applying the latest technology	The university are worried about the university's position, and that, if they still used the previous system, they would be left behind
	Following global trend	The current global trend is SAP ERP; therefore the university desired to follow the universal trend.
	Public image	The people in the university worried about the university's reputation. The system caused delays in the work which affected their public image, if their name was published in a newspaper as a result .

	Increased university size	The university wanted to add more users, add new modules, expand to multiple locations, have more functions and be accessible to new departments.
University business process change	Connection between the university and external stakeholder	There were some difficulties in connection between different units outside the university. Therefore, the university need to change their business process to connect with other external units.
	Establish new e-management department	The university culture had a new requirement of creating a new e-management department responsible for ERP system in the university, thus this department needed more IT staff and a new ERP team.
Documentation Issues	Lack of official documents in the current context	The university did not have a formal document to deal with information system in general and ERP in particular.
	No digital library of important documents of previous period	The lack of an e-channel to keep up-to-date with the university status in terms of using ERP systems impacted negatively on system maintenance, decreasing connections and the incompatibility of different ERP system between different departments across the university.

Reporting Issues	Unsolved problems	There are many unresolved issues related to ERP reporting: for instance, DM2 claimed that system users and mangers could not retrieve relevant information from the system.
	Reporting delays	Reporting delay issues resulted from the legacy system as there were no updated supplier and staff files, so staff found struggle to get the desired data on time.
IS implementation issues	Misunderstanding of ERP requirements	Misunderstanding of ERP tasks and staff activities.
	Lack of internal governances to control the IS implementation	The university did not have powerful and clear regulations to manage IS implementation.
	No clear measurements or criteria for choose the vendors and products	The university did not have clear criteria for selecting the vendors and products.
	Previous product low level of popularity internationally	The previous ERP system had a lower level of popularity internationally than the new ERP system.
	Lack of national experience in terms of dealing with ERP systems	The ERP system was operated and managed by external contractors due to the lack of existing staff ERP experience, and the over reliance on non-national staff
	The nature of decision making process of IS implementation	The way of the IS/ERP decision making process was implemented in the university.

Sub-category	Code	Quotation
Pressure on university	Increased university size	The university wanted to add more users, add new modules, expand to multiple locations, have more functions and be accessible to new departments. *"As the university improved, it increased its departments as well as its functions. As a result, new changes were required; for instance, the need of new employees and better quality was difficult due to the way the previous ERP had not been designed to match the new requirements and would cost the university more." (N2-DM2)* *Translation:* كما تحسنت الجامعة، وزيادة أقسامها وكذلك وظائفه. ونتيجة لذلك تم إجراء تغييرات جديدة؛ على سبيل المثال كانت بحاجة إلى موظفين جدد وتحسين نوعية صعبة بسبب الطريقة لم تكن مصممة لتخطيط موارد المؤسسات السابقة لتتناسب مع المتطلبات الجديدة وستكلف الجامعة أكثر من ذلك"(N2-DM2) *"All these changes needed heavy adjustments which the university could not handle; as we did not have enough professionals, including IT experts, software programmers and managers who were highly skilled to expand the system in a short period of time. The replacement was the option*

		available to overcome these difficulties." (N7-M)
		Translation:
		كل هذه التغييرات اللازمة التعديلات الثقيلة التي الجامعة لا يمكن التعامل. كما لم يكن لدينا ما يكفي من المهنيين، بما في ذلك خبراء تكنولوجيا المعلومات، مبرمجي الكمبيوتر والمديرين الذين كانوا من ذوي المهارات العالية لتوسيع النظام في فترة قصيرة من الزمن. كان الاستبدال خيار متاح للتغلب على هذه الصعوبات ". (N7-M)

The University of Sheffield. **Information School**	**Critical Factors leading to ERP replacement in Higher Education Institutions in Saudi Arabia: A Case Study**

Researchers

Arwa Mohammed Aljohani

Email: lip12ama@sheffield.ac.uk

Purpose of the research

This study aims to identify, discuss and criticize the operational, cultural and political perspectives that lead to replacement of ERP and provide both theoretical and practical insights that will enable a better exploitation of ERP within HEIs in Saudi Arabia.

Who will be participating?

Decision makers from different functional departments at Red Sea University IT managers and people in charge of ERPs and who are involved in ERP replacement decision will be invited to participate in the interview.

What will you be asked to do?

You will be asked to answer different questions during an interview. All the questions will focus on the issue of EPR replacement. As a participant in this research, the researcher will conduct an interview with you at your convenience via telephone. The interview will have duration of approximately 45 minutes. Questions asked will be about your experience with previous ERP systems and the current ERP system, why the system has been replaced and how the decision was made. You will also be asked questions about your role in the decision of ERP replacement, as well as your perceptions of the decision toward the replacement.

What are the potential risks of participating?

Participating in this research should not incorporate any risks; your identity will not be disclosed and all data collected will be used for research purposes only.

What data will we collect?

The interview will be audio recorded for transcribing purposes.

What will we do with the data?

Audio recordings will be transferred by transcribing them into a text format and then analysing them. They will be securely stored, using a password in the researcher computer. Only the researcher will have access to the digital recording. After transcription, all audio recording will be destroyed and no further use will be made from them. Any further use of the data will be for future research purposes and publications by the researcher only, and only anonymous transcribed data will be used (in case participants gave their consent for data retention).

Will my participation be confidential?

Your name will be anonymised and your identity will remain anonymous throughout the research.

What will happen to the results of the research project?

The findings of this research will be used to complete a PhD thesis which will be publicly accessible. At the same time, the result may be used to publish academic papers or to contribute to academic conferences and future research.

Appendix 5: Participant information sheet (Arabic version)

The
University
Of
Sheffield.

عنوان البحث : العوامل التي أدت الى استبدال نظم تخطيط موارد المؤسسات (ERP) في الجامعات بالمملكة العربية السعودية	جامعة شيفيلد كلية المعلومات

الباحثة : أروى محمد الجهني

البريد الالكتروني : lip12ama@sheffield.ac.uk

الغرض من البحث:

تهدف هذه الدراسة الى التعرف على العوامل التي تؤدي الى استبدال نظام تخطيط موارد المؤسسات وتوقف كل من الرؤى النظرية والعلمية التي ستمكن بدورها من الاستغلال الأفضل لنظام تخطيط موارد المؤسسات في الجامعات بالمملكة العربية السعودية.

من سيشارك في المقابلة؟

سيتم توجيه الدعوة إلى كل من صناعي القرار من مختلف الإدارات بالجامعة ومدراء قسم تقنية المعلومات والمسؤولين عن نظام تخطيط موارد المؤسسات للمشاركة في هذه المقابلة

ما الذي يطلب منك فعله؟

سيطلب منك الإجابة على أسئلة مختلفة خلال المقابلة ، ستركز جميع الأسئلة على النظامين أنجز بلس وانجز واتخاذ قرار الاستبدال ، فيضفك مشاركا في هذا البحث ، سيجري الباحث مقابله معك حسب الوقت المناسب من قبلكم ، وسوف تكون المقابلة هاتفيا وستستمر حوالي ٣٠ دقيقه ، ستدور الأسئلة التي سيتم طرحها حول تجربتك مع نظام أنجز السابق والنظام الحالي أنجز بلس ، لماذا تم استبدال النظام وكيف تم اتخاذ القرار ،وسيوجه إليك أيضاً أسئلة حول دورك في قرار استبدال تخطيط موارد المؤسسات.

ماهي المخاطر المحتملة من وراء المشاركة؟

يجب أن لا يتضمن المشاركة بهذا البحث أي مخاطر .فلن يتم الكشف عن هويتك ولاعن اسم الجامعة وسيقتصر استخدام كافة البيانات ذات الصلة بأغراض البحث .

ماهي البيانات التي سيتم جمعها ؟

سيتم تسجيل المقابلة صوتيا لأغراض التدوين (التفريغ النصي).

ما ستفعل بهذه البيانات ؟

سيتم تحويل التسجيلات الصوتية بكتابتها في صيغة نص ومن ثم تحليلها ، سيتم تخزينها سرا باستخدام كلمة السر في الحلب الأول الخاص بالباحث. سيكون من حق الباحث فقط الحصول على التسجيل الصوتي ، سيتم التخلص من كافة التسجيلات الصوتية بعد التدوين (التفريغ النصي)،فإن يتم استخدامها مرة أخرى ، وسيقتصر أي استخدام آخر للبيانات على أغراض البحوث المستقبلية والمطبوعات من قبل الباحث ،وسيتم استخدام البيانات المدونة المجهولة فقط (في حالة موافقة المشاركين على الاحتفاظ بالبيانات)

هل ستعامل بياناتي بسرية تامة ؟

سيكون الاسم مجهولا وستظل هويتك مجهولة طيلة البحث بالإضافة الى اسم الجامعة سيظل مجهولا .

ماذا سيحدث لنتائج مشروع البحث ؟

سيتم استخدام نتائج هذا البحث لاستكمال رسالة الدكتوراه التي ستكون متاحه للجميع ، وفي الوقت ذاته ، قد يتم استخدام نتيجة البحث لنشر أبحاث علمية أو المساهمة في المؤتمرات الأكاديمية أو البحث المستقبلي .

The consent form

□ I confirm that I have read and understand the description of the research project, and that I have had an opportunity to ask questions about the project.

□ I understand that my participation is voluntary and that I am free to withdraw at any time without any negative consequences.

□ I understand that I may decline to answer any particular question or questions, or to do any of the activities. If I stop participating at all time, all of my data will be purged.

□ I understand that my responses will be kept strictly confidential, that my name or identity will not be linked to any research materials, and that I will not be identified or identifiable in any report or reports that result from the research.

□ I give permission for the researcher to have access to my anonymised responses.

□ I give permission for the researcher to re-use my data for future research and publications as specified above.

□ I do not give permission for the researcher to re-use my data for future research and publications.

□ I agree to take part in the research project as described above.

Participant Name (Please print)

Participant Signature

Researcher Name (Please print)

Researcher Signature

Date

Note: If you have any difficulties with, or wish to voice concern about, any aspect of your participation in this study, please contact Dr. Angela Lin, Research Ethics Coordinator, Information School, The University of Sheffield (ischool_ethics@sheffield.ac.uk**), or to the University Registrar and Secretary.**

Appendix 7 : Participant consent form (Arabic version)

نموذج الموافقة

☐ أقر أنني قد اطلعت وفهمت وصف مشروع البحث ،وأنني كانت أمامي فرصة لطرح أسئلة حول المشروع .

☐ أدرك جيدا أن مشاركتي تعد أمرا تطوعيا وأنني أستطيع الانسحاب في أي وقت من دون أي عواقب سلبية

☐ أدرك أنه بإستطاعتي رفض الإجابة على أي سؤال ، وإذا توقفت عن المشاركة في أي وقت ،فسيتم حذف جميع بياناتي .

☐ أدرك أيضا أنه سيتم الاحتفاظ بإجاباتي في سرية تامة ولن يرتبط اسمي أو هويتي بأي من مواد البحث ، وأنني لن يتعرف علي مع عدم إمكانية التعرف علي من خلال أي تقرير أو التقارير التي تنشأ عن هذا البحث.

☐ أنني أعطي الإذن لفرق البحث بالحصول على إجاباتي المجهولة.

☐ أنني أعطي الإذن للباحث في إعادة استخدام بياناتي بغرض البحث المستقبلي على النحو المحدد أعلاه.

☐ أوافق على المشاركة في مشروع البحث على النحو المحدد أعلاه .

اسم المشارك :   توقيع المشارك :

....

اسم الباحث :   توقيع الباحث :

....

التاريخ : ....

ملحوظة :إذا كان لديك أي صعوبات أو ترغب في التعبير عن قلقك بشأن أي من جوانب مشاركتك في هذه الدراسة .
فيرجى الاتصال ب دكتور / ischool_ethics@ Sheffield.ac.uk منسق أخلاقيات البحث ، بكلية
المعلومات ،جامعة شيفلد أو الاتصال بأمين وسكرتير الجامعة.

Information School Research Ethics Panel

Letter of Approval

Date: 13[th] May 2014 TO:

Arwa Aljohani

The Information School Research Ethics Panel has examined the following application:

Title: Critical Factors leading to ERP replacement in Higher Education Institutions in Saudi Arabia: A Case Study

Submitted by: Arwa Aljohani

And found the proposed research involving human participants to be in accordance with the University of Sheffield's policies and procedures, which include the University's '*Financial Regulations*', '*Good Research Practice Standards*' and the '*Ethics Policy Governing Research Involving Human Participants, Personal Data and Human Tissue*' (Ethics Policy).

This letter is the official record of ethics approval by the School, and should accompany any formal requests for evidence of research ethics approval.

Effective Date: 13[th] May 2014

Dr Angela Lin
Research Ethics Coordinator