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ERP Benefits Capability Framework: Orchestration Theory Perspective

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ERP Benefits Capability Framework: Orchestration Theory Perspective

Abstract

ERP benefits can be classified as automation, planning and innovation benefits. This research aims to answer two research questions: (1) what are the ERP resources and organizational complementary resources (OCRs) required to achieve each group of benefits? and (2) on the basis of its resources, when should an organization invest more in ERP resources and/or OCRs so that the potential value of its ERP is realised? Evidence from studying 12 organizations in different countries and validating the results with 8 consultants has been drawn upon to develop the ERP Benefits Realisation Capability Framework, showing (1) that each group of benefits requires ERP resources (classified into features, attached technologies and IT department competences) and OCRs (classified into practices, attitudes, culture, skills and organizational characteristics) and (2) that leaping ahead to gain innovation benefits before being mature enough in realising a firm's planning and automation capabilities could be a waste of time and effort. This research can be used as a benchmark for designing the various blueprints required to achieve different groups of benefits from ERP investments.

Keywords: ERP, Orchestration Theory, Capability Theory, Benefits Management, IT Business Value

1. Introduction

Although at the end of the twentieth century there was some debate about the impact of investing in IT on organizational performance (Carr 2003), it is now axiomatic that IT creates value for organizations (Kohli, Grover 2008) by affecting the process of organizational performance (Schryen 2013) and the organization as a whole (Nevo, Wade 2011). Although we know how to create this value, the financial performance of firms is still uncorrelated with investment in IT (Ho-Chang Chae, Koh & Prybutok 2014). Indeed, although the value of IT investments are divided into costs, benefits and risks (Badewi, Shehab 2013), the main component of the value creation comes because the benefits outweigh the costs of implementation (Tiernan, Peppard 2004).

Although the Benefits Management approach was widely believed to be critical for realising success (Ward, Daniel 2006, Ward, Taylor & Bond 1996, Baccarini, Bateup 2008), some writers argue against this (Breese 2012, Haddara, Paivarinta 2011) and empirical research led to

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3 disappointing findings compared to those of the project management approach (Badewi 2016,
4 Badewi 2014, Badewi, Shehab 2016). However, combining benefits management practices with
5 project management practices in a single project benefits governance framework enhances the
6 value of IT investments more significantly than project management frameworks alone do
7 (Badewi 2015). Moreover, studying the connection between project management and benefits
8 management can lead to new and fruitful ways of overcoming the current failing rates of IT
9 investments. According to Badewi (2016), the main connection point between project
10 management and benefits management is the “blueprint”, or future snapshot of what an
11 organization will look like after implementation, including the processes, information, culture
12 and attitudes toward the IT artefact. This blueprint (the To-Be state) aims at delivering the kind
13 of organizational capability at the end of the day that realises the benefits (Ward, Daniel 2006,
14 Axelos 2011, Serra, Kunc 2015).

23
24 The Resource Based Theory (RBT) lens has been found useful for understanding the relationship
25 between the organization’s differential benefits (competitive advantage) and the emergent
26 capability from the new blueprint which comes from integrating IT into organizational
27 processes. This emergent capability can be the source of competitive advantage when it is
28 valuable, rare, inimitable and non-substitutable (VRIN) (Seddon 2014). But investment either in
29 technology or IT department competences, on its own, will never be rare nor non-substitutable if
30 it is merely expended; rather, it becomes irreplaceable through the complementary resources
31 (OCRs) of the organization (Melville, Kraemer & Gurbaxani 2004, Schryen 2013). For
32 instance, IT department competences are not a source of competitive advantage regardless of
33 their rareness or non-reproducibility unless they are mediated with organizational agility (Chen
34 et al. 2013). Consequently, synergizing both IT resources (e.g. Hardware, Software, IT
35 department competences) and organizational complementary resources (e.g. organizational
36 culture, structure) is believed to be an inevitable source of competitive advantage because it
37 creates unique capabilities (Nevo, Wade 2010). In order to realise the benefits from Information
38 Technology (IT) projects, Melville et al (2004) developed a business value model for doing so.
39 According to this model, IT resources (Technological IT Resources (TIR) and Human IT
40 Resources (HIR)) can achieve the expected benefits so long as organizational complementary
41 resources (OCR) exist, such as non-IT organizational structure and culture. The ERP System
42 subjects it to a special and critical look because it requires (and leads to) a radical change in the
43 organizational culture, structure and power (Morton, Hu 2008, Ke, Wei 2008), besides making it
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possible to integrate various information systems and technologies into a single harmonised system.

ERP benefits are heterogeneous in the mechanism of their realisation and the required organizational characteristics: these benefits can be classified into operational, managerial, strategic, IT infrastructure and organizational benefits (Shang, Seddon 2000, Shang, Seddon 2002). However, this research adopts Zuboff's framework (Zuboff 1985), classifying them into automation, planning and transformation benefits, as used by (Uwizeyemungu, Raymond 2009) for ERP systems. The rationale for using this classification is that it classifies ERP benefits into three groups only, each group requiring its own capabilities (Uwizeyemungu, Raymond 2012) and thus a special blueprint (detailing ERP resources and OCRs). Given this framework, the first research question is:

RQ1: what are the ERP resources and Organizational Complementary Resources (OCRs) required to achieve the different kinds of ERP benefits?

At the same time, the sustainability of a certain resource (or capability) as an enduring source of competitive advantage can be questioned (Makadok 2001, Teece 2007). In other words, each organizational capability may have a limited lifecycle (Helfat, Peteraf 2003). In this case, the ability of the CIO (Peppard, Galliers & Thorogood 2014) or CEO (Chadwick, Super & Kwon 2015) to design, develop, expand and retire the portfolio of resources/capabilities would be the source of sustainable competitive advantage.

Resource orchestration theory in general gives us very general guidelines for the role of management in orchestrating (e.g. expanding, building, etc.) the organizational resources in such a way as to optimize performance (Sirmon et al. 2011). The root of this theory comes from contingency theory (Sirmon and Hitt, 2009). In contingency theory, superior performance is an output of the "fit" between different organizational factors, different assets and/or different capabilities (Keller 1994, Drazin, Van de Ven, Andrew H 1985, Brush, Artz 1999). Likewise, the fitness between ERP and organizational function affects performance (Seddon, Calvert & Yang 2010, Morton, Hu 2008). This fit should be a dynamic construction (Albu et al. 2015) to reflect continuous growth and evolution until the "critical mass" is achieved (Davenport, Harris & Cantrell 2004). Thus, the second research question is

RQ2: when, and on what basis, should an organization deploy more resources to leverage the ERP Business Value?

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3 Thus, this research aims to develop an ERP capability process model, using the orchestration
4 theory lens (i.e. the dynamic and evolving fitness perspective), to advise professionals when they
5 should invest in ERP resources and when they should invest in ERP organizational
6 complementary resources. Process theories shed light on the sequence of activities and thus
7 explain how particular outcomes evolve over time (Shaw, Jarvenpaa 1997). This process model
8 is believed to be able to help us understand how ERP resources should be structured and
9 developed over time to realise the ERP benefits. To sum up, to answer the first question, this
10 research contributes to knowledge by extending the Melville's concept of IT business value
11 (2004) to consider the resources required to realise each group of ERP benefits. Then, to answer
12 the second research question, the orchestration theory, combined with the framework of
13 synergizing the IT resources with OCRs, should indicate the emergence of new capabilities
14 (Piccoli, Ives 2005).

24 25 **2. Literature Review**

26 27 **2.1 ERP Business Value Model**

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29 IT business value is the impact of IT investments on organizational capabilities through the
30 different levels of the organization (Schryen 2013) and thus organizational performance
31 (Melville, Kraemer & Gurbaxani 2004). Likewise, ERP, besides its ability to reduce a firm's risk
32 in uncertain circumstances (Tian, Sean 2015), is perceived to have a positive impact on
33 organizational performance including the improvement of productivity and profitability
34 (Nicolaou, Dehning & Stratopoulos 2003, Nicolaou 2004); of inventory reduction (Madapusi,
35 D'Souza 2012); and of other measures of performance (Shang, Seddon 2000), together with
36 improving organizational capabilities such as renovation (Ma, Dissel 2008), and leanness
37 (Powell, Riezebos & Strandhagen 2013) capability. Therefore, conditioned by many factors, it
38 affects organizational profitability (Dehning, Pfeiffer & Richardson 2006), the organization's
39 market value (Anderson, Banker & Ravindran 2006) and therefore a higher stock market return
40 (Ranganathan, Brown 2006). Thus, if it is implemented, integrated, used, absorbed and
41 assimilated appropriately, it can be a source of competitive advantage (Stratman 2007, Romero
42 et al. 2010) . Therefore, the ERP business value could be defined as the impact of ERP on
43 organizational capabilities which affects the organization's financial and non-financial
44 performance.

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3 There are different business value models and frameworks (Soh, Markus 1995, Dedrick,
4 Gurbaxani & Kraemer 2003) for understanding how IT investments create value for
5 organizations. The IT Business Value model of Melville et al (2004) and the subsequent
6 research (Schryen 2013, Nevo, Wade 2011) are used in this study because they consider both
7 kinds of resource (organizational and IT). Indeed, a misfit between the ERP package (ERP
8 resources) and the organizational functions (OCRs) affects both the success of implementing an
9 ERP project (on time within budget) and project investment success after its implementation
10 (Gattiker, Goodhue 2005). Therefore, ERP should be customised to a certain level and
11 organizational processes should be changed to keep the fit between the two (Soh, Sia 2004).
12 Therefore, this conceptual demarcation of resources by Melville enables us to use orchestration
13 theory to make a certain IT group of resources contingent on a set of organizational
14 complementary resources
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24 **2.1.1 ERP Resources**

25 IT resources are IT investments in hardware, software applications and IT department skills,
26 with the aim of achieving a specific business objective (Aral, Weill 2007, Wang et al. 2012).
27 ERP resources may be defined as the ERP functions and features that enable an organization to
28 record and process data accurately, along the supply chain (Forslund 2010) and/or it may be that
29 the ERP features of integration, flexibility and transversality enable organizations to automate,
30 inform and transform ways of doing business (Uwizeyemungu, Raymond 2012). Furthermore,
31 an ERP system such as SAP has not only its own integrated modules but also other extended
32 modules such as supply chain management, customer relationship management and other
33 business intelligence applications (Holsapple, Sena 2005, Snabe et al. 2008). The existence of
34 one module affects the entire performance: the more the modules are implemented and
35 integrated, the higher the benefits realised (Madapusi, D'Souza 2012).
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44 Human IT resources are also found to have an impact on ERP performance such as the ability to
45 deal with any lack of fit between the organization's business processes and the ERP package
46 (Customization) (Chou, Chang 2008). Furthermore, the IT competences in project management
47 are found to be critical for delivering a ERP project within time and cost (Dezdar, Ainin 2011a)
48 in a way which satisfies the users and assures them of its quality (Tsai et al. 2011, Tsai et al.
49 2012) thus realising the benefits (Velcu 2010, De Toni, Fornasier & Nonino 2015).
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55 **2.1.2 ERP Organizational Complementary Resources (OCRs)**

56 Since ERP implementation does not happen in a vacuum, the existence/lack of the various
57 Organizational Complementary Resources (OCRs) is argued to be critical for the variation in the
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3 levels of success (Albu et al. 2015). OCRs that are found in the literature to be necessary are the
4 organization's strategy, structure (Albu et al. 2015), control system (Kallunki, Laitinen & Silvola
5 2011), compensation system (Silveira, Snider & Balakrishnan 2013), people (Sammon, Adam
6 2010) including their demographics (age, cognitive style, education, gender and work
7 experience) (Jasperson, Carter & Zmud 2005), peer advice ties (Ann Sykes 2015) and their
8 psychological factors (e.g. readiness to change in attitude (Stratman, Roth 2002)) and top
9 management roles (Law, Ngai 2007, Liu, Seddon 2009, Dezdar, Ainin 2011b) (e.g. their role in
10 the continuous alignment between the organization's strategic objectives and the long term
11 capabilities of the ERP (Chou, Chang 2008)).
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19 Since benefit realisation from investment in an ERP system, i.e., the maturing of the capability
20 to yield sustained benefits, depends on the effective use of the system (Somers, Nelson & Karimi
21 2003), the factors that affect the effective use of the system should be considered as OCRs in
22 achieving such benefits. Not only is the negative impact of breaching the psychological contract
23 with the users considered (Klaus, Blanton 2010), but also psychological factors such as
24 perceptions of ease of use, usefulness, quality of vendor, quality of service and expected benefits
25 in realising the desired benefits should be considered (Petter, DeLone & McLean 2008, DeLone,
26 McLean 2003). Kamhawi (2008) finds that the perceived shared benefits affects the perceived
27 ease of use and usefulness of an ERP system. As predicted by the Theory of Reasoned Action
28 (TRA) (Montano, Kasprzyk 2008), the theory of Bagchi et al (2003) uses TRA to show that user
29 involvement and attitude to the ERP system affect the way in which it is used.
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38 **2.2 ERP Benefits Dynamic Capability Model**

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40 There are two main schools of thought about understanding how benefits can be realised. On the
41 one side, the benefits management school focuses on identifying, planning, executing, reviewing
42 and exploiting benefits (Ward, Taylor & Bond 1996). On the other, the capabilities school
43 focuses on identifying and assessing the impact of the organization's capabilities, competences
44 and resources required for realising benefits (Doherty, Ashurst & Peppard 2011,
45 Uwizeyemungu, Raymond 2012). However, ways of reconciling the two schools are hardly to be
46 found in the literature. Studies which have attempted to bridge the gap between them are
47 Seddon's study (2010), which shows that while current ERP resources and OCRS (i.e. functional
48 fit and overcoming organizational inertia) are necessary for realising short-term benefits, long
49 term benefits will not be felt unless benefits management is imposed through the implementing
50 of improvement projects. In addition, Velcu (2010) found that when ERP resources are aligned
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3 with the organizational strategy, they affect the performance of internal business processes and
4 therefore customer benefits and financial benefits.
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7 **2.2.1 Dynamic Versus operational capabilities**

8 Capabilities are of two types: operational and dynamic. While the operational capabilities are
9 involved in the routine of performing individual tasks, the dynamic capabilities are involved in
10 the routine of coordinating, integrating, expanding and retiring these tasks (Helfat and Peteraf,
11 2003). Amit and Schoemaker (1993) define operational capability as the ability of an
12 organization to deploy, integrate and make use of its assets toward a specific goal. According to
13 this definition, which this paper adopts, IT capability is the ability of an organization to deploy,
14 integrate and make use of its IT resources to enhance organizational performance (Wang et al.
15 2012). Furthermore, the capability does not count as a full organizational capability until it
16 becomes a routine integrated in the organization processes to the point where it permits the
17 “repeated, reliable performance of an activity” (Helfat and Peteraf, 2003).
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20 Each operational capability has its lifecycle, starting from the time when it was established. It
21 becomes mature and ends with what is called capability branching. When capability branching
22 occurs, the factors external to a capability (which can be external or internal to an organization)
23 affect its lifecycle, such as a managerial decision to have a “selection event” point which
24 transforms the performance by transforming the capability (Helfat, Peteraf 2003). Indeed, a
25 managerial decision can reverberate throughout the creation of strategic resources (Sirmon et al.
26 2011). Thus, Helfat in 2007, describing the complementary operational capabilities (at the
27 branching stage) of dynamic capabilities (e.g. to renew or redeploy), underlines the function of
28 top management of structuring, bundling and leveraging the organization’s resources/capabilities
29 for the sake of achieving sustainable competitive advantage. To structure the resources means to
30 acquire, accumulate and divest them. Once acquired, they must be bundled (tailored) into the
31 organization’s system so that the leveraging process (coordinating and deploying) can take place
32 to achieve the organization’s performance targets. Hence, it has been found that it is critical for
33 top management to prioritize, synchronise and support (orchestrate) the resource management
34 activities of managers at all levels of the firm in the interests of organizational performance
35 (Chadwick, Super & Kwon 2015) and sustainable competitive advantage (Sirmon et al. 2011).
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52 **2.2.2 Resources Orchestrations**

53 Asset Orchestration is the “capacity of managers to create purposefully, extend or modify the
54 resource base of an organization” (Helfat et al. 2007) so that corresponding capabilities can be
55 created (Helfat et al. 2007). Resource orchestration takes a firm one step further toward mixing
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3 resources, capabilities and interventions by managers that deploy more resources (Sirmon, Hitt
4 & Ireland 2007). Thus, resource orchestration is the integration of asset orchestration and
5 resource management (Chadwick, Super & Kwon 2015). Each capability has lifecycle started at
6 its foundation stage but they all end differently. They can end by any of the 6 Rs (renewal,
7 retirement, redeployment, recombination, replication, or retrenchment) (Helfat, Peteraf 2003).
8 Thus, by orchestration mechanisms, organizational performance can be transformed from one
9 level to the next by deliberately “branching” the lifecycles of the organization’s capabilities.
10 Each resource orchestrated into an organizational IT portfolio creates a new capability that
11 builds a new organizational environment state that may require a new resource (Cui, Pan 2015).
12 In other words, resource orchestration theory implies that deploying an extra resource will lead
13 to something (a capability) that leads to incremental performance (benefits) (Davis-Sramek,
14 Germain & Krotov 2015).
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24 Orchestration affects not only a firm’s IT resources; it can also cover IT resources alone or
25 organizational complementary resources alone, or these two combined. Wang et al (2012) show
26 that investing in Technological IT Resources (TIR) at a time of stability is more effective at such
27 times, whereas investing in Human IT Resources (HIR) is more viable in a dynamic
28 environment. Indeed, Sirmon and Hitt (2009) find that the fit between the resource investment
29 decision (which resource to invest in) and thwe deployment decision (where to deploy the
30 resource) is more critical to the organization’s performance than simply seeking to maximize
31 any of the decisions alone. Therefore, it can be proposed that synergizing and fitting IT
32 resources and organizational complementary resources (which resources should be deployed
33 where and when) is more critical that merely rationalising the purchase of IT resources one by
34 one or the development of organizational intangible assets (human resources capabilities) at
35 some distance from the strategy of the IT resource management. By applying the same argument
36 to ERP benefits, synergizing an ERP resources plan and plans for developing organizational
37 human resources is expected to have a greater impact than focusing on any of these islands
38 alone.
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49 **2.2.3 Benefits Management and Dynamic Capabilities**

50 Benefits management frameworks and models are implicitly inherent in the concept of dynamic
51 capabilities. For instance, researchers spotlight the value of benefits exploitation capability in
52 realising more benefits from the current IT portfolio (Ashurst, Hodges 2010, Ashurst, Doherty &
53 Peppard 2008) and ERP system (Norton et al. 2013) by investing in organisational resources
54 (e.g. training) rather than technological ones. Likewise, the active benefits management
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framework shows that benefits management is a continuous process (Remenyi, Sherwood-Smith 1998). Davenport et al (2004) underlines that ERP implementation is an ongoing process until the “critical mass” of implementation is achieved, able to integrate the main function of departments so that the full value of ERP can be realised. Therefore, it is practical to use a benefits review as a mechanism to follow up implementation and take action so that the organizational fitness with current and new ERP implementation is perceived to be associated with the organizational sustainable financial performance from ERP (Nicolaou, Bhattacharya 2008).

The factors required to realise ERP benefits are immense. Without a significant capability in the organization to change as it implements the new technology, the benefits will not be realised and thus the value of investing in this technology will not be felt. The activities required for delivering ERP benefits are project management factors (for IT Resources) and management factors for business change (for OCRs) (Badewi 2016). Both should work together in a unified and consistent framework for managing the value curve which underpins the organizational capabilities (Axelos 2011, Jenner, APMG 2014, Serra, Kunc 2015). Figure 1, adopting the value curve, helps to visualise the idea of the different blueprints required for achieving different benefits

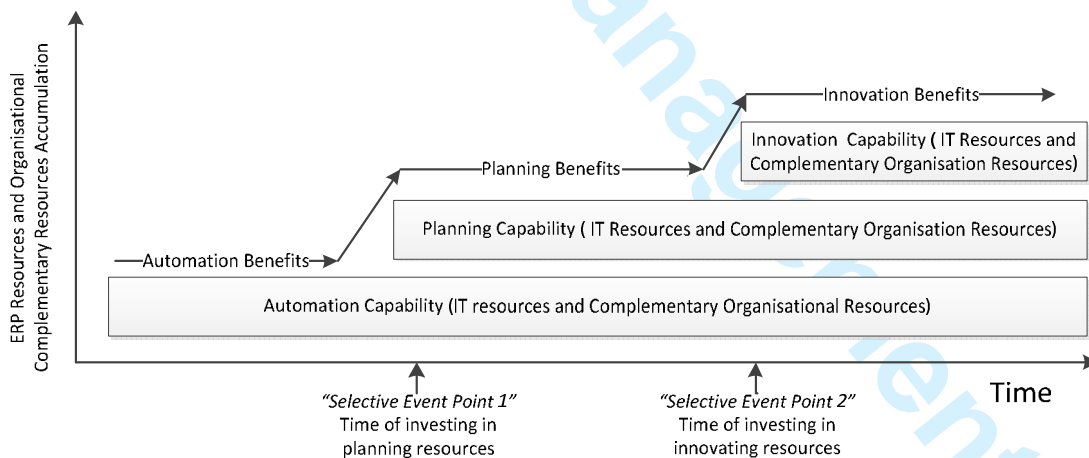


Figure 1: Framework showing the Capability for Realising ERP Benefits

3 Research Methods

In this study, we conducted case analysis of 12 organizations that have implemented ERP and 8 consulting organizations in a range of developing and developed countries; namely, Egypt, Saudi Arabia, the UK, USA and Australia. Table 1 summarizes the major characteristics of these firms.

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3 We used purposeful sampling and considered several factors in selecting the cases. First,
4 Information Systems in Developing Countries (ISDC) are quite different from their counterparts
5 in developed countries, in particular in the context of IS innovation (Avgerou 2008). In addition
6 scholars working in the interpretive research paradigm believe that the reality of one
7 organization is not the same as that of another (Walsham 2014). However, selecting
8 organizations from different countries, contrasting and comparing the organizational factors,
9 above all the cultural factors, has been found very helpful in theory development. Second, A UK
10 private organization which was perceived to have shown unusual performance by means of its
11 ERP system was contrasted with another private one from the USA which was perceived to have
12 shown normal performance with the same means. In addition, a UK council which had a
13 relatively well-integrated system was contrasted with an Australian council which had a less
14 well-integrated ERP system. A Saudi ministry which had invested more in IT was contrasted
15 with a Saudi Bank which had invested more in people. Third, five Fast Moving Consumer
16 Goods (FMCG) organizations in Egypt, the Emirates, Saudi Arabia and the UK were contrasted
17 because all of them face the same problems of tracking, planning and innovating in their product
18 lines. Finally, a healthcare organization which had a continuous innovation programme was
19 contrasted with the other organizations. Later, eight consultants in the UK and Egypt were
20 approached. They were selected for their long service (15 years or more) and for their experience
21 in international projects involving ERP implementation and/or the management of realising ERP
22 benefits.
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37 We collected data for this study both from interviews and archives. The participants were
38 approached in a snowball process at some public and private organizations where ERP was
39 implemented and/or where they worked as senior ERP consultants. The average interview time
40 was four hours, including initial and follow-up sessions. Interviews were tape-recorded unless
41 informants objected. To assure the accuracy of the interview data, we conducted number check
42 (Lincoln and Cuba, 1985) in which the original informants verified our tape transcripts or
43 interview notes. The aim of these interviews was to grasp the social constructions of experts
44 about the different ways in which they implemented the ERP and then to validate and contrast
45 these with the results from the previous stage.
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53 Data have been collected from interviews in 12 organizations which have implemented ERP and
54 8 consulting organizations in a range of developing and developed countries; namely, Egypt,
55 Saudi Arabia, the UK, USA and Australia (Table 1). The participants were approached in a
56 snowball process at some public and private organizations where ERP was implemented and/or
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3 where they worked as senior ERP consultants. The average interview time was four hours,
4 including initial and follow-up sessions. In parallel, relevant documents were collected from
5 each organization. Annual IT reports (such as progress reports on plans for realise benefits) and
6 information about ERP implementation and post-implementation plans were analyzed.
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10 Data analysis used familiar approaches for inductive studies (Eisenhardt, 1989; Glaser &
11 Strauss, 1967). Analysis began with detailed written account and schematic representation of
12 each ERP implementation process. After constructing the case histories, we conducted within
13 case analysis, where the basis for developing early construct surrounding ERP implementation
14 process. For this purpose, we focused on analyzing the interview data as well as integrating and
15 triangulating facts from various data sources. Triangulation of archival and interview data
16 enables richer and more reliable description of each case (Jick, 1979) and improves construct
17 validity (Yin, 2003).
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21 Next, cross case analysis was conducted, looking for similar constructs and themes in the cases
22 (Eisenhardt and Graebner, 2007). In order to preserve the integrity of replication logic across
23 cases (Eisenhardt, 1989; Yin, 2003), we began cross case analysis after most data had been
24 collected. We relied on constant comparison across multiple informants and over time to detect
25 concept patterns (Glaser and Strauss, 1967). We also used archival data in order to enable richer
26 and more reliable description of each case (Jick, 1979) and improves construct validity (Yin,
27 2003). In an iterative fashion, we analysed the data by continuously visiting the consistency
28 between the data and an emergent structure of theoretical arguments (Miles & Huberman, 1994).
29 We also presented the inductive model to informants inviting their feedback and comments.
30 These interactions were conducted through face-to-face meetings, telephone discussion, and
31 email dialogue.
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35 Information Systems in Developing Countries (ISDC) are quite different from their counterparts
36 in developed countries, in particular in the context of IS innovation (Avgerou 2008). In addition
37 scholars working in the interpretive research paradigm believe that the reality of one
38 organization is not the same as that of another (Walsham 2014). However, selecting
39 organizations from different countries, contrasting and comparing the organizational factors,
40 above all the cultural factors, has been found very helpful in theory development. In the present
41 study, a critical realist paradigm was used, which contrasted transcripts. As shown in the
42 interview guide (Table 6), peers were asked about what others had done, to see whether they
43 agreed or disagreed and why, on the principle of “revealing and challenging prevailing beliefs
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and social practices” (Myers, Klein 2011). In fact, getting rich input from different countries improved the process of theory development since different experiences in different contexts helped to explain the differences in realising the benefits from the use of ERP.

A UK private organization which was perceived to have shown unusual performance by means of its ERP system was contrasted with another private one from the USA which was perceived to have shown normal performance with the same means. In addition, a UK council which had a relatively well-integrated system was contrasted with an Australian council which had a less well-integrated ERP system. A Saudi ministry which had invested more in IT was contrasted with a Saudi Bank which had invested more in people.

Moreover, five Fast Moving Consumer Goods (FMCG) organizations in Egypt, the Emirates, Saudi Arabia and the UK were contrasted because all of them face the same problems of tracking, planning and innovating in their product lines. Finally, a healthcare organization which had a continuous innovation programme was contrasted with the other organizations. Later, eight consultants in the UK and Egypt were approached. They were selected for their long service (15 years or more) and for their experience in international projects involving ERP implementation and/or the management of realising ERP benefits. The aim of these interviews was to grasp the social constructions of experts about the different ways in which they implemented the ERP and then to validate and contrast these with the results from the previous stage.

Table 1: Interviewees

	Organization	Country	Role	Exp	System	Available Systems*
1	Pharmaceutical Company	Egypt	ERP Manager	5	SAP	P, S, A
2	Health Care Services	Saudi Arabia	SCM Manager	4		P,S,A, D
3	Pharmacy Retailing Group	Saudi Arabia	Corporate Sales Manager	20	EPICOR	P,S,A
4	Ministry	Saudi Arabia	IT manager	15	Best-of-breed	All Except Pr
5	Bank	Saudi Arabia	ERP integration manager	10	Best-of-breed	All Except Pr
6	Government	Australia	CIO	17	Best-of-breed	All Except Pr
7	Safety and Security tools manufacturing	USA	ERP Analyst	14	Oracle	All
8	Nuclear Technologies	UK	ERP Consultant	15	Oracle	All except Pr
9	Food and Beverage production	UK	ERP Manager	7	SAP	All
10	Food and Beverage production	Emirates	Supply Chain Manager	6	SAP	All
11	County Council	UK	ERP Manager	8	Oracle	All except Pr

	(Focus Group)			Programme Manager	12			
				ERP Customer Manager (ERP) vendor representative	20			
12	Food and production (Focus Group)	Beverage (Focus Group)	Egypt	IT Infrastructure Manager	6	SAP		All except O
				MM ERP manager	5			
				SD ERP manager	5			
				CIO	20			

*P → Purchasing, Logistics and Inventory System , S→ Sales and Customer Services, A→ Accounting Information System, D→ Advanced Data Analytics Pr→Production and M→ Fixed Assests and Maintenance system, O→ Other customized systems

4 Findings

RQ1: what ERP resources, Organizational Complementary Resources (OCRs) are required to gain the different kinds of ERP benefits?

ERP benefits in this research are divided into automation, planning and innovation benefits, while automation benefits concern the productivity of organizational processes, better management of warehouses, informational (planning) benefits concern improvements in production scheduling and in decision-making (Uwizeyemungu, Raymond 2010). Transformational (innovative) benefits, for their part relate to the development of new products. This framework is used in the literature that deals with understanding ERP effects (Uwizeyemungu, Raymond 2009, Uwizeyemungu, Raymond 2012, Uwizeyemungu, Raymond 2010). Building on this area of research, this research divides benefits into automation, planning and innovation benefits

4.1 ERP Automating Benefits

ERP Automating benefits are benefits that are realised once an organization automates its value-engineered business processes. Automating current processes does not add much value in itself; rather, automating the new processes that are value-engineered is the main way to derive value from automating benefits (Peppard, Rowland, 1995).

“The problem that we faced in ERP implementation in our company is automating the AS-IS. We did not have at that time the vision of the To-Be. Indeed, it was a very big mistake which costs us a lot, later. Without understanding why do we do what we do, we will not be able to “fit” the ERP in a way that would let the benefits be realised” ERP consultant in UK from the food industry.

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3 Automation benefits of ERP are seen in the productivity of the organizational processes, better
4 management of warehouse space and better integration of resources (Uwizeyemungu, Raymond
5 2010), cost reduction through time reduction, elimination of double entry, reduction of errors
6 and less time in the cycle of purchasing and selling.
7
8

9 10 **4.1.1 ERP Automating Organizational Complementary Resources (OCRs)**

11 Regardless of the importance of ERP resources to achieve automating benefits, they are not
12 sufficient unless they are complemented by the organization's capacity to realise these benefits.
13 Therefore, to be able to have ERP automating, ERP automating OCRs should first be available.
14 ERP automating capability is defined as the ability of an organization to map all business
15 processes on its ERP system in such a way that all data from their origin to their destination are
16 recorded and analysed using ERP resources.
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22 The ultimate automating benefits can emerge only when the users of the system integrate its use
23 in their practices in such a way as to minimize the manual work. These practices can be valid
24 only if there is a positive attitude (based on ease of use, usefulness and the need to use) to the
25 system, which inclines the users to use it. This attitude may be governed by the organization's
26 values vis-à-vis changes and organizational transformations (Besson, Rowe 2012). Likewise,
27 this research has found that cultural factors such as openness to new ideas and readiness to
28 change are critical for accepting the ERP as a concept. A disciplined culture (with its
29 routinisation of the organization's processes) is found critical for successfully mapping the
30 business functions on an ERP system. Indeed, openness and readiness to change usually come if
31 one is self-confident enough to be able to control the environment (the fear of the unknown
32 represented by new technology and new business processes).
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42 *“Before implementing the ER ... [we tried] to make **business process re-***
43 ***engineering** before implementing the ERP. By doing so, we could hedge **the risk of***
44 ***the negative perception by the users and their reactions to the new processes and***
45 ***the risks of new technology.**”* ERP Consultant in Egypt
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49 This may explain why Ram et al (Ram, Corkindale & Wu 2015) found a positive relationship
50 between the readiness to change and successful business process re-engineering and system
51 integration. Indeed, this culture was found to have affected the different factors such as the
52 users' age, education and background.
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57 *“ You know what is our problem in integrating the processes of ERP in our*
58 *employees DNA? They are less familiar with technology. Although we had an easy*
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3 *system before implementing SAP, but SAP for them has been overwhelming. This*
4 *company as you see is in a **very remote area**. The human resources available **are not***
5 ***qualified to use such technology**... To be honest, when you see a company*
6 ***dominated by old mature people it is not really easy to change them.***” CIO of an
7
8 Egyptian food manufacturing company
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10 **4.1.2 ERP Automating Resources**

11 The ERP resources required to achieve automating benefits are classified under technologies,
12 features and IT department requirements. The features that appear to be important are features
13 that enable workers to adapt quickly to the system from the psychological perspective, features
14 such as the convenience and comfortable interfaces and self-help support features, to reduce the
15 anxiety of the users and decision-makers about adopting a new system. Although ERP is known
16 in automation software, some organizations are not able to experience its automating benefits.
17 Such benefits need not only to be integrated in a certain department, but also needs integrating as
18 a whole which functions as a single system in the enterprise. Thus, if ERP cannot be integrated
19 in this way, it fails to confer the automating benefits.
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27 The technologies that are perceived to be required are scanning and text reading technologies
28 and tracking technologies such as RFID and Bar Code, which connect an organization via
29 technologies with other external organizations and, most important, which integrate one
30 technology with others. For instance, unlike the British local authority body which has a
31 “scanning” system (to digitalise the manual invoices and external documents with an external
32 stakeholder which is not integrated with the current system), the Australian governing council
33 struggles hard to integrate its own system with those of its vendors, citizens and other external
34 parties because they do not have a suitable integration platform
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41 *“I mean we would have focused **on our software suppliers** to move much faster into*
42 *the area of **connecting with the core system**. For example, let’s say the taxation*
43 *system – make that available for citizens as well itself: mobile applications hifi*
44 *applications and IPad applications android, all that is very, very slow to come*
45 *forward. **I mean that is one of the problems**”* CIO Australian Government
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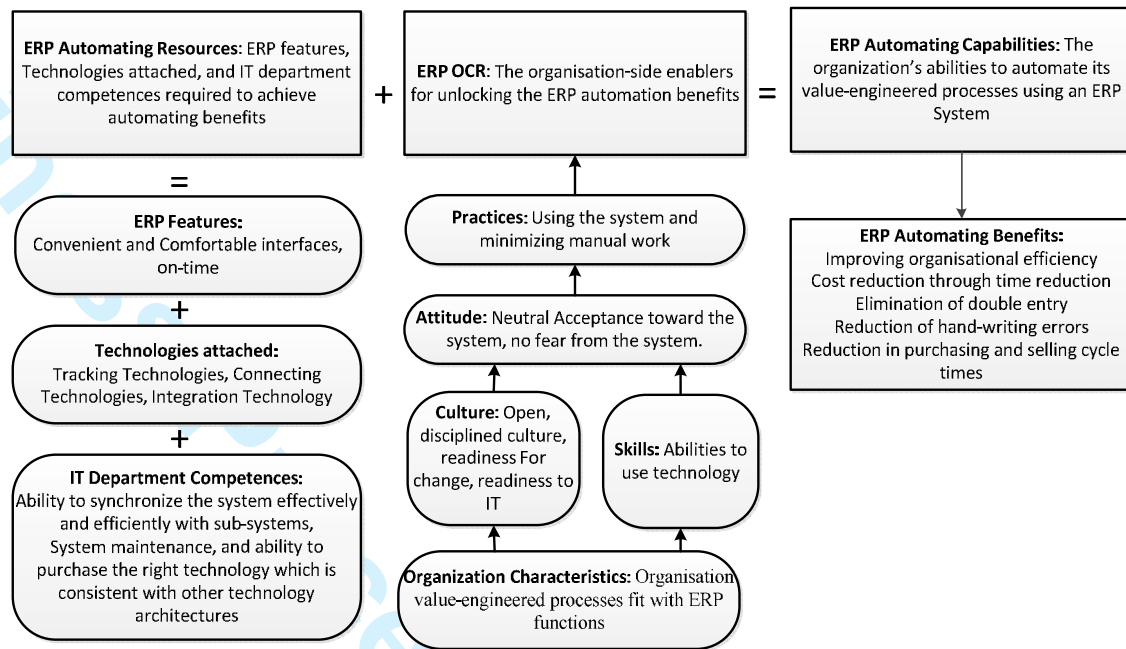


Figure 2: Process of Realising ERP Automating Benefits

Although ease of use and perceptions of usefulness are psychological factors, ERP resources can ease the way a job is done by using simple customized systems in routine places, as a Point of Sales (POS) system does. Unlike the Egyptian food company in which users were challenged in using the system because it caused a bottleneck in the processes of their sales functions, a pharmaceutical company in its marketing department overcame this problem by implementing an “easy-interface” system for sales representatives and integrating this system with the ERP.

“Yet our marketing department has struggled a lot in implementing the ERP. After discussing that with the XYZ consulting company, we implemented a very easy point of sale [application] which is integrated with ERP. Doing this mad the implementation very successful and now the marketing and sales people are using the ERP in virtually all their transactions” MM (Material Management) SAP consultant at an Egyptian pharmaceutical company

The IT department competences required are technical competences such as the ability to synchronize the systems effectively and efficiently without breaching, so that users can trust the reliability and adaptability of the process.

4.2 ERP Planning Benefits

Planning and controlling benefits are benefits that are realised from the ability to use the ERP system to understand, and therefore to predict, the behaviour of the internal and external environment so that an organization can plan and therefore control, its environmental factors.

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3 ERP, according to the literature, can, it is argued, affect the forecasting quality (Dorantes et al.
4 2013). Nevertheless, this research found that this statement is based on many assumptions. The
5 assumptions can be classified into OCRs and ERP resources as illustrated in Figure 3.
6
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8 **4.2.1 ERP Planning Organizational Complementary Resources (OCRs)**

9 ERP planning capability is the ability of an organization to use ERP planning resources so as to
10 understand and therefore control, the external and internal environment. OCRs were found to be
11 critical for building ERP planning capability (being part of the organizational routine) and were
12 found to be either users' factors (skills and attitudes) or organizational factors (characteristics
13 and culture).
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19 Capability needs to be mature before it can realise its benefits and be self-sustainable. This will
20 not happen until it is integrated in the organizational routine or becomes part of the users'
21 practices. For it to be a part of the users' routine, they must value the use of it and perceive the
22 ease of use in the planning process. Both perceptions are required for a positive attitude toward it
23 (Badewi, Shehab & Peppard 2013). Without knowing how to use it, these perceptions will
24 undervalue it lowest and therefore will not use it effectively enough for gain the expected
25 benefits (Burton-Jones, Grange 2012). In this research it has been found that, to use it,
26 employees need to be IT qualified (and able to work on reports) and qualified in business
27 practices (able to recognize planning models in sales and/or inventories). As the quotation in
28 Table 2 shows, the reporting skills of an IT-user are his/her ability to comprehend and use the
29 ERP reporting features smoothly, whereas the business reporting skills are the his/her ability to
30 understand and to apply the business planning principles and concepts of ERP reporting
31 functionalities.
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41 Hence the quality of the planning system is found in some studies not to be critical for using
42 these systems (Popovič et al. 2012), where the knowledge share culture could be the missing link
43 (Popovič et al. 2014). In this research, we found that a negative knowledge share culture affects
44 management policies in setting different permissions and accessibilities regarding data in
45 different departments in such a way as may hinder effective planning.
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51 *The problem in planning through the system is that **decision-makers want to hold on***
52 *to the information: they do not want to share information across different*
53 *department” ERP Implementation Consultant at an Egyptian Company*
54

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56 *“In my experience, there is **no clear intention to enable organizations to share data.***
57 *As a supply chain manager I **cannot see** the demand forecasts from the marketing*
58 *department although we have an integrated system. That is why we are still working*
59
60

on a **push inventory**. You cannot imagine **how much we lose because of that**. I have talked to top management a million times but no way." Supply Chain specialist in Food Manufacturing at an Emirates company

Table 2: sample of quotations showing the skills required for planning using ERP

IT- users reporting skills	Business reporting skills
<p>"Although we gave them a lot of training on planning features, users do not know how to use the planning features of the system. They are not interested in the system. The training was not effective at all because they were not involved in the system itself" Production Planning SAP consultant at Egyptian Food manufacturing</p>	<p>"Based on my experience of ERP systems, a significant number of organizations fail to recoup planning benefits not because of the ERP; but because users do not understand the planning concepts in it." ERP consultant in Egypt</p>
<p>"Planning activities could be more abstract, as I mentioned before (realising the benefits requires money and time). When I saw MRP implemented that essentially matched supply and demand, I saw the planning people overwhelmed. They planned on a spread sheet and implemented it on ERP. It is more accurate but it is not easy for them. If users do not use it, then you will not get the benefits." ERP analyst at an American company manufacturing safety equipment</p>	<p>"In the Inventory department, the users and super users do not understand the inventory models. However, in the Accounting and Costing department, the new manager gives cost accountants training in modern accounting principles. This has had a significant impact on users to not only believe in the power of the system, but also this made them start to plan costs using the ERP" MM SAP consultant at an Egyptian food manufacturing company</p>

Furthermore, if an organization does not value the planning function of management, it cannot be expected to plan using ERP, which poses more challenges in learning and adopting. This idea was triggered when an Egyptian expert claimed that the first reason for not achieving any planning benefits from ERP is that the organization in itself does not have any manual/ or structured method of planning. This argument was scrutinized by the other interviewees and found to apply to Arabic organizations at least.

*"Planning!! They do not have **any structured planning system**. Planning in best cases is for the week. I have never seen any of them using any **ERP planning tools**. Organizations should know how to plan first before using ERP for planning"*
ERP Oracle Consultant in Egypt

Thus, we found an organization that applies lean principles in Egypt has a strong planning system to minimize its costs. This indeed helped the organization in question to realise planning benefits that were beyond its peers. Furthermore, organizations which strongly believer in the power of technology in planning and scheduling activities outperform others which do not. This is consistent with another research belief that pre-implementation expectations affect the use of

the system in the post-implementation phase (Saeed et al. 2010, Veiga et al. 2013). However, there are organizations that value the culture of planning, but do not believe in the value of using ERP for planning.

*“The users undermine the use of ERP in planning. They **believe that ERP is not for planning**. It is just to automate the processes. They still plan using Excel. There is **no clear motivation to explore or exploit the ERP planning features**” MM specialist at an Egyptian food company*

4.2.2 ERP Planning Resources

ERP resources are technologies, features and IT department competences. The features found to be most important are their convenient statistical reporting features, convenient at least from the perspective of users and visual tools in reporting features. In one organization,

*“I think one of the weaknesses of the ERP system is that sometimes tools for planning are **not too easy to use**. Planning data **can be overwhelming** to the user and I know **upnext??** in my other company, we have reliable custom reports and custom screens to **help users really be comfortable with planning that are provided by the ERP system**.” ERP Analyst at an American company producing safety equipment*

In the same vein, since planning is almost about using historical data to predict and therefore to control future behaviour, the power of ERP to provide high level statistical abilities conveniently for the average person, with easy-to-use statistical interfaces in an organization will help ERP to be incorporated in its normal daily planning and controlling practices.

*“Now, after we upgraded the Oracle ERP, we have **convenient and easy-to-use features that enable normal users to use the statistical power of the ERP system**. This has enhanced **many planning activities**” ERP Manager of a Nuclear Power organization in the UK*

Technologies that are perceived to be relevant are the capacity to store data, speed of receiving and sending data and reporting technologies.

*“If that were much more closely coupled with the finance system, it would be beneficial everywhere, because at the moment it is a whole section doing that. All its performance is to report on it. That is the next step, reporting, because there are many different systems and different databases. We **now have to develop our own data warehouse that we report from**. And that form would sort out a lot of problems as well”*

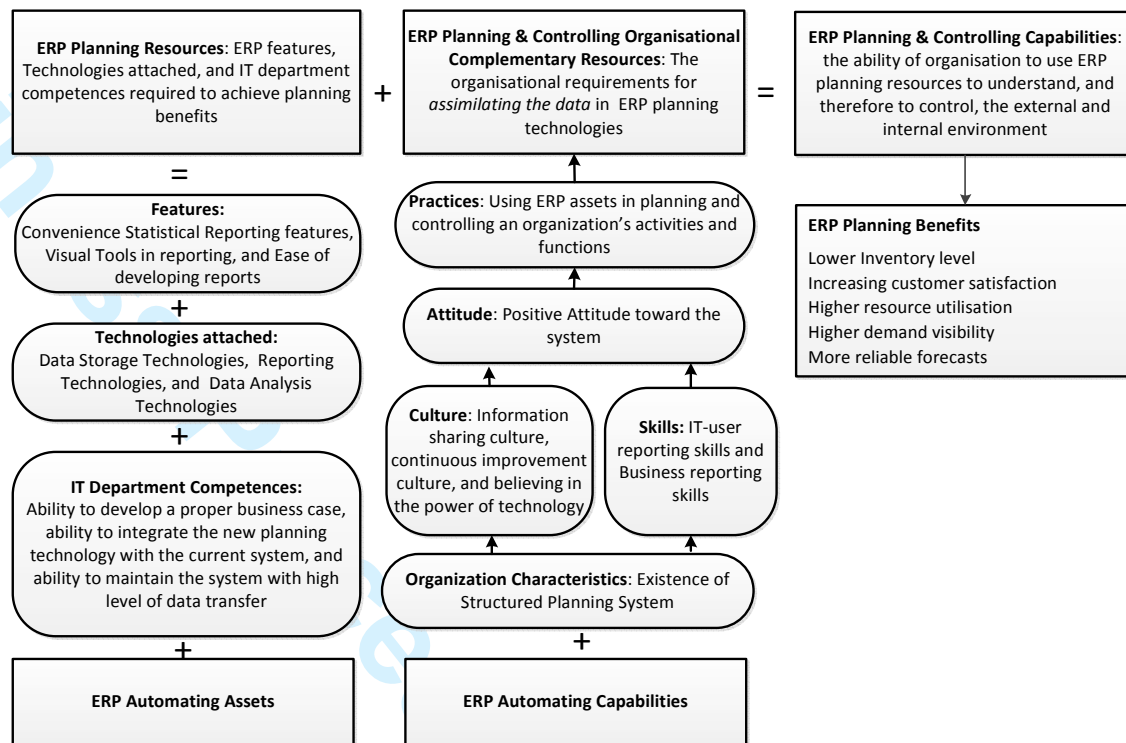


Figure 3: Process of realising ERP Planning Benefits

Finally, IT technical competences are needed to ensure the integrity of the system as well as the real-time information availability. IT business partnership competence (Chen et al, 2013) is the ability of the IT department to collaborate with other business functions; this is required, in particular the ability to develop a business case. Business case development should take account of different internal stakeholders in estimating the impact of a new planning system. It should do so not only to make them buy into the system but also to let them plan how the benefits could be realised in terms of the time required to realise the expected level of performance, responsibilities, duties and accountabilities.

*“Yes, **business case!** You know we bought a planning system for our ministry costing millions. Nobody used it for ages, until a consultant **discovered it**. After that this consultant made **a plan for us to use it**. I agree with you, benefits management helped us to bring life back to this dead system. **Once the benefits were identified**, the senior staff brought the system in and the business plan was developed to use this the system. Now it is working and integrated with the current IT infrastructure (an ERP system)”*
IT member of the senior staff in a Saudi ministry

But of course it is not advisable to wait until a consultant company “discovers” a purchased system. Without the IT ability to develop a business case in such a way as to buy the sponsors in and assign responsibilities for realising the benefits for the expected IT purchases, this IT is built for failure (Maklan, Knox & Peppard 2012)

4.3 ERP Innovation Benefits

Business innovation benefits in this research come very close to the type III IS innovation of Swanson's typology (Swanson 1994), which is embedded in core business technology, is contingent by IS strategy to business and IS business oriented. Achieving IT business innovation is not a matter of IT innovation only; rather, it is a matter of the organizational capacity to innovate using IT as well (Ashurst et al. 2012).

4.3.1 ERP Innovation Organizational Complementary Resources

ERP innovation capability is the ability of an organization to innovate in its business functions and processes by means of ERP resources. Indeed, once the organization practices (routines) help an organization to innovate, they become the most robust enablers of innovation through ERP (Srivardhana, Pawlowski 2007). This routine is mainly based on the following organizational mind-set.

“What you can say to create a routine of innovation by a continuous alignment and improvement of business processes using IT” SCM of a healthcare service in Saudi Arabia

Once an organization is able to understand its environment (and has incorporated this in its routines) or examine its understandings using its IT resources and to buy and integrate the “novel” IT resources to enhance its organizational processes, products and services, it will be able to tackle innovation from its experience of investing in ERP and its ancillary systems. Indeed, the mentality which creates this “routine of innovation” is conditioned by the organization's belief (that of its top management, IT staff and non-IT staff) in the power of technology to make organizational innovation possible. This belief is reflected in the organizational attitude to using technology in setting the organization's strategy and in its organizational culture. It was clear from the innovative organizations that their culture had an intimate knowledge of information technologies and their use.

However, some organizations share this same attitude but do not have the ability to use the data available in datasets since they do not share the scientific approach to dealing with data; for example, they have no culture of testing hypotheses to differentiate between the valid and invalid ones (Scientific Culture). The organizations that are not interested in understanding their environment are not expected to innovate using their data. Seeking to understand and examine one's surroundings is the cornerstone of innovation.

ERP, if it is well integrated, can help in understanding and examining one's circumstances by providing reliable, valid and timely data. Nevertheless, the ability to use statistics in creative

ways to understand these data patterns so that the new realities/perspectives/insights can be understood is the main bottleneck. Creativity in using the data for decision making opens the potential for unleashing opportunities, that have not so far discovered cross-sectional analysis, through correlating different aspects in different departments. For instance, one UK respondent extolled

“... cross company data scientists, justifying the job role of an analytical centre of excellence. We have got health and safety analysts that can do Chi-square and do it from a health and safety viewpoint. If we can combine the health and safety with procurement information we can now say just one very simple thing, which is that the contractors working for us have more accidents” Expert user in the UK (Nuclear Power)

An Innovative Support Unit, also called a Centre of Excellence (CoE), allows innovative ideas to be filtered and shared across departments. Furthermore, if data need to be translated into projects or programmes, the Innovative Support Unit will sponsor the programs (Govindarajan, Trimble 2010). Although one of the Saudi companies uses an innovation-supporting unit, under the name “business development unit”, the lack of a clear strategy impairs the alignment between the new initiatives that leads to contradictions between different programs, leading to unsatisfactory performance.

Furthermore, we found that a highly centralized bank in Saudi Arabia was unable to realise innovation although it had ERP innovation resources, whereas a decentralized Ministry of Finance in Saudi Arabia tended to achieve more innovation from its ERP. This evidence supports the research findings of Tambe et al (2012) that organizational practices such as decentralization act as enablers for achieving innovation and productivity using IT.

4.3.2 ERP Innovation Resources

Besides the ERP innovation OCRs, ERP innovation resources are required, as illustrated in Figure 4. ERP resources range from the IT ability to customize the current system reliably and validly and the scalability of the system (its ability to extend and keep pace with the growth and functions of the organization (Mital, Pani & Ramesh 2014) to the deployment of “novel” technologies (i.e. being the first to use and integrate them).

One of the main problems of a traditional ERP system is that it is too strict to enable an organization to use it in planning and innovation, as is widely accepted in the literature (Davenport, 2000). As a CIO at Australian Council says,

“However people normally do not like that because it means that they have to follow a very strict path how the system works. If it is outside the system, there is more flexibility”.

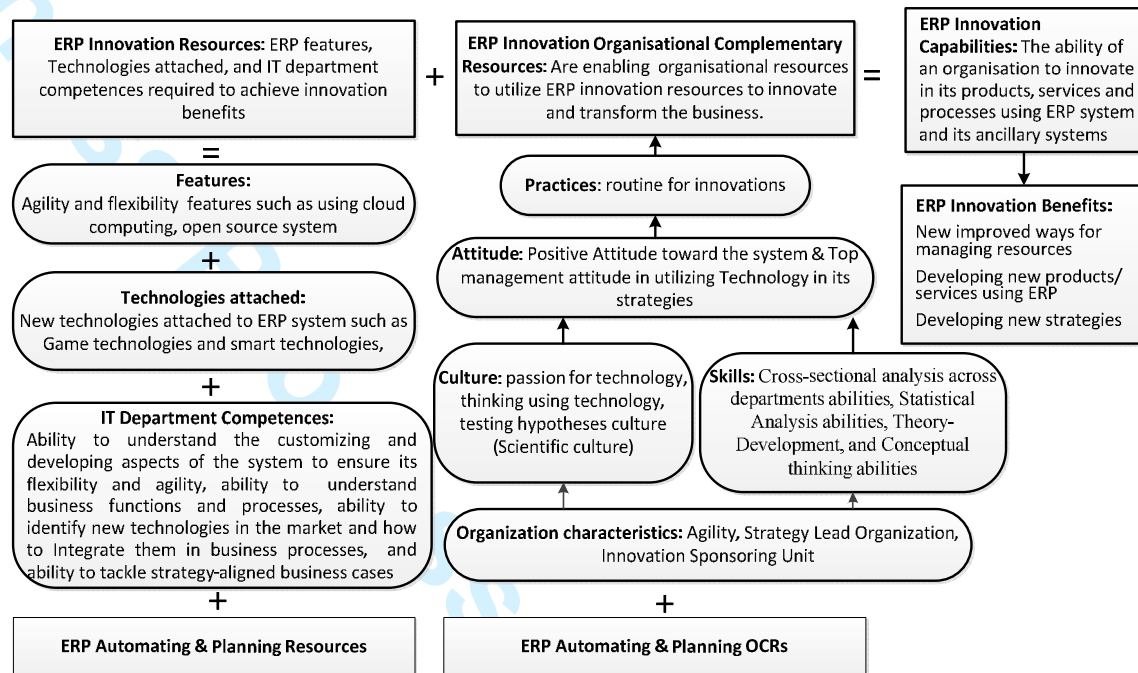


Figure 4: Process of realising ERP Innovation Benefits

At the same time, we found that organizations which have a more flexible ERP infrastructure are more agile in seizing new opportunities. For instance, a Saudi enterprise has adapted a cloud ERP system in the belief that the staff will become flexible enough to implement a road map of the IT projects that will be integrated in its ERP system. The same applies to the safety and security equipment manufacturing organization in the US:

“One brand factory cannot produce finished goods for the other brand. This introduces a transformation project which is included in the ERP implementation. The ERP system helps facilitate the continuous transformation of our business because **they are more flexible** and rather than automate the business processes, I would agree that the ERP system could be a vehicle for transformation.” ERP analyst in safety and security equipment manufacturing

Gaming technologies, using Kinect technology, were used in one Saudi organization in a limited way; however, this gave it superiority to its competitors in the short run. We believe that this superiority will not be sustained once the competitors buy this new technology; however, the ability of an organization to be superior in purchasing and fitting novel technologies is the main source of competitive advantage. To tell the truth, the ability to purchase the best technology at

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3 the right time by the IT department is sometimes limited by its ability to develop a business case
4 that addresses this need. Since the business-IS linkage is critical for innovation processes
5 (Tarafdar, Gordon 2007), we have found in this research that when the job specification and
6 description of the IT staff identify this competence, innovation capabilities through ERP are
7 improved.
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11 *“I had a very good background in supply chain management before being a SAP*
12 *consultant. My understanding of the current business processes enabled me to talk*
13 *to functional managers to introduce new ideas in business by using the unused ERP*
14 *functionalities. Now it becomes part of my business to help users to introduce new*
15 *services to the customers ...part of my job description is to train business users and*
16 *help them to increase their performance by innovating new ways for doing tasks ...*
17 *Now my job is not technical troubleshooting; rather my task is to improve business*
18 *processes through the ERP”* SAP SCM of a healthcare service in Saudi Arabia
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23 **RQ2: when, and on what basis, should an organization deploy more technologies to** 24 **leverage the ERP Business Value?**

25 The ERP organizational resources required for all groups of benefits are not the same, as shown
26 in Figure 2 to 5. But they are complementary. In other words, as supported by Figure 1 and as the
27 quotations show in Table 3, the expected planning blueprint (which is based on ERP planning
28 resources and ERP planning OCRs) will not create the expected planning capability without
29 having the automation blueprint. Likewise, the required blueprint for business innovation
30 benefits will not achieve the desired capability until the planning capability is mature enough.
31 The rationale of the need for automating (integrating) ERP resources for planning is that the
32 production planning is based on the sales and material planning data (Günther, Grunow &
33 Neuhaus 2006). Without such data, the production manager will not be able to plan (understand)
34 the production patterns using ERP-enabled features.
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37 In the same vein, the ERP automation OCRs are important for the ERP planning capabilities. If
38 there is a negative attitude to the system (a positive attitude is required for the successful
39 realising of automation benefits) and users are not skilled enough in business or IT to plan
40 through the system, it is difficult to expect these users to innovate their processes and
41 products/services using the data in them. Likewise, in ERP resources, without having an
42 integration platform to collect the current and accurate data from the source and send it to the
43 data use locations (for automational benefits) and without the ability to synchronize a huge
44 amount of data from across the organization and its supply chain (a requirement for planning),
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the ability to identify new opportunities for improvement through the ERP data (ERP innovation benefits) decline.

Table 3: Sample quotations showing the interdependence between Automation, Planning and Innovative ERP blueprints and capabilities

	Planning	Innovation
Integration	<i>“if we could have a better-integrated planning system with 10 year financial and other business planning etcetera, a lot of corrections for the moment, because planning is done in isolation. Let’s say this example with us. We plan all our budget scenarios with this thing but we do not actually use the financial system for the planning. We do financial planning outside of our system. So there is a lot of excel spreadsheet and other staff and discussions here and there but it is all outside our financial system and it would be a great benefit having all that in the system”</i> CIO Australian	<i>“So I would consider that this global transformation will – could – not achieve without the ERP system because it is an integrated system, it was a global system. Sales orders from US customer go to the same system, sales orders could be sourced from the Japan factory and they have the same shared system. If it was global systems, sales order were in the US part of the same system as the Japan factory”</i> ERP analyst in safety and security equipment manufacturing” ERP Analyst from a US manufacturing company
Integration and Planning	<i>“Recently I went to company X..... I spoke to the business people. They do not care. A lot of spreadsheets cut into small spreadsheets not in SAP. Spreadsheets were everywhere. No one knows what is going on. The tale is growing, growing and growing. Complexity is growing. Inventory is growing. We have no control. My point is how we can control if we do not understand? How can we innovate and improve while we do not understand? Once you control the data, you can control the environment and thus you can understand what is going on. By understanding you can build the improvement.”</i> ERP UK consultant	

By comparing and contrasting the five manufacturing companies, the lower the level of an organization’s capabilities the more it can gain higher level benefits. For instance, EGY F has a medium level of ERP resources since it lacks tracking technologies but the systems are integrated. It does not have ERP OCRs because staff strongly resist the system. Its readiness to change is the lowest of the five cases and its ability to use technology is lower than theirs because it is dominated by old and less skilled labour (being located in a remote area). This organization achieves the lowest level of Automational Benefits. Furthermore, although it has invested a great deal in planning ERP resources (such as a huge capacity for data storage, very advanced reporting systems, advanced data analysis systems and visual reporting), it has not realised any planning benefits. The same applies to its innovation benefits (from ERP).

EGY P and Saud P are similar in their ERP resources and OCRs for automation and planning. However, unlike EGY P, Saud P invests more in training users for business certificates and IT skills. The business skills of EGY P’s employees can be considered the major bottleneck for enabling users to plan using ERP, since the users are unfamiliar with forecasting, analytic and different inventory systems in the SAP. This is why they import files to Excel sheets to plan

using the traditional methods that they used before ERP. Indeed, although neither has ERP innovation resources nor OCRs, Saud P is able to innovate from ERP because it could continuously enhance its pricing systems in line with seasonal demand.

Some aspects of UK F and Emir F are quite similar (all the resources are the same except the lack of tracking resources in UK F and lack of a knowledge sharing culture in Emir F. On the one hand, UK F does not have a good tracking system which obviously affects the quality of its data and leads to trouble in planning by means of ERP. This organization has all the ERP planning resources and OCRs. But because of its invalidated (wrong) data, its capacity to plan through the system is significantly reduced and this negatively affects innovation through the system. On the other hand, Emir F lacks a knowledge sharing culture and hence its top management restricts the accessibility of data from different departments. This radically affects planning and innovation because users and decision-makers cannot see over departmental borders. Nevertheless, internally each department plans well, using the available historical data. Innovation is implemented through a central department which has access to all data.

Table 4: Level of Benefits for Five Manufacturing Companies

	Automation Blueprint		Planning Blueprint		Innovation Blueprint		Benefits
	ERP Resources	ERP OCRs	ERP Resources	ERP OCRs	ERP Resources	ERP OCRs	
Saud P	Black	Black	Black	Black	Black	Black	A(3) P(3) I(2)
EGY P	Black	Black	Black	Black	Black	Black	A(3) P(2) I(1)
EGY F	Black	Black	Black	Black	Black	Black	A(1) P(1) I(1)
UK F	Black	Black	Black	Black	Black	Black	A(2)P (1) I (1)
Emir F	Black	Black	Black	Black	Black	Black	A (3) P(2) I(2)

Automation ERP Resources – Black: well integrated and tracked from the original point to the point of use

Gray: integrated but no tracking of the movement of products **white:** neither integration nor tracking

Automation ERP OCRs – Black: this organization uses ERP in its normal processes with no trouble

Gray: few struggles in the work using ERP

Planning ERP Resources - Black: this organization has the required ERP resources for planning

Planning ERP OCRs- Black: this organization is able to use ERP in its routine planning **Gray:** this organization has some elements required for planning but it lacks some elements such as a knowledge sharing culture)

Innovation ERP Resources – Black: innovation resources are available. **Gray:** some resources are available but others are not such as the IT ability to understand business and ability to find suitable “novel” technologies and deploy them successfully

Innovation ERP OCRS - Gray it lacks some requirements for innovation benefits, such as a scientific culture and cross sectional analysis

Benefits scale of 3; three is the highest, one is the lowest (null) and two is normal. A is for Automating Benefits, P is for planning benefits and I is for innovation benefits

5 Discussion

Unlike the prevalent notion in the literature that ERP kills innovation in organizations (Trott, Hoecht 2004), this research has found evidence that ERP can be a source of innovation. Without

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3 the ability to have reliable, timely and valid data from the current IT resources (by matching and
4 integrating ERP functions to organizational functions and processes (Soh, Kien & Tay-Yap
5 2000)), planning (understanding the data patterns) would be impossible, even new planning if
6 resources are invested in it. Without understanding the patterns, innovation is difficult. This
7 supports and extends the propositions of Srivarhana and Pawlowski (2007), which are based on
8 Absorptive Capacity theory (Zahra, George 2002) of the ability of ERP to be an enabler for
9 sustained business process innovation when an organisation is able to acquire (by ERP
10 automation OCRs), assimilate (by ERP planning OCRs), or transform and exploit knowledge (by
11 ERP Innovation OCRs innovation) through ERP. Thus, as supported by the literature (Gupta,
12 Kohli 2006), the organization's ability to integrate ERP in its current processes so that data are
13 collected from their source to be used (on condition of having the users' and organization's
14 ability to absorb and assimilate) in information and knowledge creation is the key to realising the
15 potential value of investment in ERP.
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25 As illustrated in Table 5, this research contributes to five streams of research: namely, RBT, IT
26 Business value, Orchestration theory, benefits management and ERP benefits taxonomy. RBT is
27 based on the idea of identifying the resources that cause rent (abnormal profit beyond that of
28 other competitors) (Seddon, 2014). Unlike previous research which suggests that ERP is a
29 commodity and cannot be a source of competitive advantage (Seddon 2005), this research
30 contributes to this argument by suggesting that it can be so if we consider the time factor in
31 orchestrating different ERP resources and OCRs. i.e. when the resources should be purchased,
32 developed or built. Timing depends not only on the IT competence to understand and bring the
33 new technology to the organization (Piccoli, Ives 2005) but should also be based on the level of
34 maturity of the organization to realise lower level benefits from the current IT assets portfolio,
35 for instance, maturity in attitude to the ERP. In this research, while the attitude required for
36 automational benefits involves merely an acceptance of technology, this acceptance should be
37 stronger if planning benefits are to recouped and so should the belief in technology as an
38 enabler of transformation by innovation. These findings support Jaspersen's argument (2005)
39 for the implementation of ERP in stages so that users can see the positive outcome from the
40 current ERP implementation before deciding to upgrade/invest in more resources.
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52 Unlike the current Resources orchestration theory stream, which suggests that competitive
53 advantage requires adaptation to external environmental factors (Teece, Pisano & Shuen 1997),
54 this research spotlights the role of mature internal capabilities (built on internal resources
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combined with OCRs) in determining the timing for upgrading, transforming or extending current capability.

The IT Business Value concept of Melville et al (2004) is extended in ERP implementation which, besides being an infrastructure for other IT projects, entails the management of radical organizational change. ERP resources are found to be features, the technologies attached and IT department competences. OCRs are the organization characteristics that affect the culture and users' skills. Skills and culture affects the attitude, which is translated into practices.

Combining the Melville framework with the ERP benefits taxonomy of Automation, planning and innovation, has helped us to provide the three blueprints required for the three organizational capabilities which ensure that the three groups of benefits are realised. Therefore, this research argues, the role of the Benefits management team is not only to audit benefits (Badewi 2016) but also to manage the evolving process of realising ERP benefits until they reach the "critical mass" (Davenport, Harris & Cantrell 2004) which is identified in this research as the innovation blueprint.

Table 5: Contributions to knowledge

Stream of research	Contribution to knowledge
IT Business Value (Melville, Kraemer & Gurbaxani 2004)	The IT framework is extended. The OCR resources are classified into practices, attitude, culture, skills and organizational capabilities. IT resources are classified into features, attached (ancillary) technologies and IT department competences.
ERP benefits taxonomy of Automate, Inform and Transform (Uwizeyemungu and Raymond, 2009;2010; 2012)	This framework is used, but the required OCRs and IT resources are classified and listed.
Orchestration Theory (Helfat et al. 2007, Teece 2007, Sirmon et al. 2011)	This research contributes by considering the level of use of the current internal resources before deciding to invest in new technology or develop new organizational resources/capabilities. It is used to understand when the organization should invest in a higher level of capability (OCRs and ERP resources)
Resource Based View (Seddon 2014)	Timing of investment can be a factor in achieving abnormal financial performance
Benefits Management (Davenport, Harris & Cantrell 2004, Ward, Taylor & Bond 1996, Esteves 2009, Remenyi, Sherwood-Smith 1998)	ERP benefits management role should be extended until the organization is able to innovate in its processes and products and services through the data held by the ERP databases

6 Conclusion

Although the "P" in ERP stands for planning, many academics and practitioners still believe that ERP applies to automation only. This research spotlights that the ability to invest in ERP can

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3 increase the innovation and planning capabilities of the organization only if it is extended and
4 grown at the right time and if it is supported by OCRs. It is not cost effective to push an
5 organization to achieve all the benefits at the same time; rather, it is clear that an organization
6 would not be able to enjoy a higher level of benefits until it achieves a significant number of
7 lower-level benefits. Thus, investing in higher-level benefit assets directly after an ERP
8 implementation, when there are no organizational capabilities available to use these assets, could
9 be inefficient. Moreover, it could be stressful to users when they see plenty of new ERP
10 resources without the ability to use them. Although it could be of slight benefit to introduce, for
11 example, business intelligence to employees in the “stabilizing period” (Badewi, Shehab &
12 Peppard 2013) , from the financial perspective, it is a waste of money since the benefits would
13 not be realised as expected. Therefore, orchestrating ERP assets with the development of
14 organizational capabilities is important for achieving the greatest effectiveness and efficiency of
15 the resources available to the organization.
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26 It is interesting to note that interviews with people in developing countries enrich the analysis in
27 planning and automating benefits, forming a contrast to interviews with people in developed
28 countries, which focused on the benefits of ERP business innovation. This is one of the main
29 benefits of the critical realist paradigm. Furthermore, diversity in the countries participating in
30 this research allows insightful analysis of new organizations that do not have enough experience
31 with ERP systems to guard against deriving the benefits from automating and planning before
32 seeking to achieve business innovation benefits through buying more ERP resources.
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38 This study is interpretive in its nature; it comes to explore a phenomenon that some
39 organisations outperform others in utilizing ERP asset. Although it reveals many interesting
40 findings, it needs to be backed by a positive research to translate the findings into propositions
41 and hypotheses to be tested using either case studies or survey research. This research comes to
42 create knowledge gaps in other research to develop models and theories to rediscover the power
43 of an ERP system in enabling organisation to achieve business innovation.
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Appendix

Table 6: Interview Guide

	Question or Statement	Rationale for the Question or Statement
1	Let me introduce myself, my university and my research project	To familiarise the interviewee with the interview and to let him/her understand the aim and objectives of the research
2	Could you introduce yourself?	To reveal the years of experience, type of experience, which ERP system(s) he/she had experienced and which module(s) he/she had had more experience of.
3	What are the benefits of an ERP system?	To reveal all the benefits perceived by the respondents without any bias from researcher intervention.
4	What are the benefits of the Accounting System, Procurement system, Inventory system, production system? [Question modified according to the respondent's experience]	To get in-depth information about the benefits of each module because the previous general question might have led the interviewee to talk about "general benefits". This question motivated the respondents to talk in-depth about the ERP benefits in his/her area of expertise.
5	Of the basis of what you have said, could we classify ERP benefits into Automating benefits, planning benefits and transforming benefits? If so, could you give me examples of each?	This question comes in a biased way to validate my understanding of what has been said so far. If the interviewee accepts this, he/she will support my argument by more explanation to reinforce this classification. If not, he will advise me what the classes should be.
6	Do you think these benefits could come without intervention? Do we need to do something to manage them?	The interviewee is expected to remember from his experience how the benefits were realised. Even if his organization has not done anything to manage the benefits, he is expected to say, "although some benefits, such as X & Y were achieved without much effort, realising these benefits needed some management".
7	What was required to gain the automating benefits? (giving examples of other organizations)	To get a list of the factors, capabilities and/or environmental factors that affected the conferring of automating benefits. The interviewee is expected to

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	which gained these benefits)	compare and contrast his/her experience with the experience of others
8	What about planning benefits? (giving examples of other organizations which gained these benefits) planning benefits
9	What about transforming benefits? (giving examples of other organizations which gained these benefits) transforming benefits