

# Impact of Business Flexibility Capabilities on Firm Performance: Es Perspective

Anupam Saxena, M.P. Jaiswal

**Abstract:** Enterprise Resource Planning (ERP) systems have become transaction backbone of organizations in the private, governmental and non-governmental non-profit sector, seeking growth. According to research firm Gartner, fully 85% of the fortune 500 firms have implemented ERP and increasingly small to medium enterprises (SMEs) are finding ways to incorporate ERP systems. While on one hand when organizations are going for large scale ERP implementations, often a debate is raised whether ERP deployment contributes towards the business flexibility capabilities of firms or not. Using a conceptual model firmly grounded in the resource-based view as a frame of reference was developed, hypotheses generated and tested for 53 large Indian manufacturing firms, with respondents being senior most business and IT executives to investigate the potential link between ES resources and its contribution to business flexibility capabilities and contribution of business flexibility capabilities on performance. For this, three important relationships are posited between: ES resources and business flexibility capabilities, business flexibility capabilities and firm performance and ES resources and firm performance Findings of this study highlights that ES resources was not positively associated with business flexibility capabilities, also association between business flexibility capabilities with firm performance was low. Based on the strong empirical evidence, the study suggested that ES resources are not contributing towards business flexibility capabilities and managers going for such systems should tread with caution.

**Key words-** Resources, Capabilities, Firm performance, Resource based theory, Value creation, Business flexibility capabilities

## I. INTRODUCTION

Enterprise systems (ES / ERP-II) software packages promises seamless integrated application environment and automate the data entry process (Davenport 2000; Hitt, Wu et al. 2002). In order to take advantage from seamless integration, firms have invested hugely on such resources making it a single largest investment in the history. In spite of making similar investments in ES by large firms variation exists in their performance (Beard and Summer 2004; Karimi, Somers et al. 2007) which needs to be understood. There actually exists no empirical evaluation explaining the variation in performance by using resource based view and taking Business Flexibility capabilities into consideration, consequently the present study will aim to understand the variation in performance. Accordingly, we evaluate whether ES enabled business flexibility capabilities lead to the enhancement of performance.

**Manuscript Details Received on July 2012. (\* Corresponding Author)**

**Dr. Anupam Saxena\***, Department of Operation Management, Lal Bahadur Shastri Institute of Management, New Delhi, India

**Dr. M.P. Jaiswal**, Department of Information Management, MDI Gurgaon (HR), India

The remainder of this paper is organized as follows: First, relevant literature review is discussed. Then the development of hypothesis and proposed research model is discussed. Subsequently research methodology and empirical data is analyzed as per the major research question. Finally, the discussion section comprises of results and implications for research and practice.

## II. LITERATURE REVIEW

In this section, we review the characteristics of resource based view, business flexibility capabilities and firm performance.

### 2.1 The RBV: conceptualization of business capabilities

The resource based view (RBV) has become one of the standard theories to explain the variation in firm performance in the same industry (Hoopes, Madsen et al. 2003). The resource based view (RBV) has become one of the standard theories to explain the variation in firm performance in the same industry over time (Hoopes, Madsen et al. 2003; Melville, Kraemer et al. 2004). RBV is based on two important underlying assumptions of resource heterogeneity and resource immobility. Resources and capabilities possessed by competing firms are heterogeneously distributed and may be a source of competitive advantage when they are valuable, rare, difficult to imitate and non-substitutable by other resources (Wernerfelt 1984 ; Barney 1991). Further when protected by barriers of imitation like isolating mechanisms (Rumelt 1984) such as historical uniqueness, causal ambiguity and embeddedness (Dierickx and Cool 1989; Barney 1991; Peteraf 1993) these resources and capabilities can be a source of sustainable competitive advantage (Mahoney and Pandian 1992). Resources such as assets and infrastructureserve as the basic unit of analysis, when these resources are embedded with firm specific socially complex processes can lead to the formation of firm wide specific capabilities (Day 1994; Soto-Acosta and Meron~ o-Cerdan 2008). In this regard, Makadok (2001) considers capability as a special type of resource which is non-transferable and embedded in the basic fabric of the firm which improves the productivity of the other resources possessed by the firm. While resources can be purchased from market, capabilities cannot be purchased and it is rooted in firm specific business processes. Present study distinguishes business flexibility capabilities into 2 categories (i) Technical business flexibility and (ii) Organizational and managerial business flexibility.

### 2.2 ES resources and capabilities

ES resources can assist in the formation of the complex chain of processes (capabilities) which may lead to better performance (Santhanam and Hartono 2003; Bhatt and Grover 2005). Role of capabilities as a differentiator in performance is primarily based on the theoretical assumptions of different approaches (Ragowsky and Gefen 2008) and studies which have taken business flexibility capabilities into consideration is very limited (Please refer to the table in Appendix 2 for studies undertaken in this regard).

**2.3 Conceptualization of ES resources**

As such there is no generally accepted definition of this construct (Stratman and Roth 2002) and often it is defined in terms of the functionality of the most popular software packages capable of integrating information and business processes across the firms (Rosemann and Watson 2002; Gattiker and Goodhue 2004). In this study ES resources can be treated as a “packaged business software systems that allows firms to automate and integrate its data and business processes across the firm to produce and access information in a real time environment”.

**2.4 Conceptualization of Business Flexibility capabilities**

Firm’s resource based view theory states that unique capabilities difficult for the competitors to imitate can lead to competitive advantage for firms. Research also suggests that those firms who have got the required flexibility to adapt rapidly to changing business requirements are able to realize superior benefits ( Davenport 2000; Prahalad and Krishnan 2002). Present study will consider business flexibility construct as the ability to adapt to rapidly changing environment and take both technical as well as organizational and managerial aspects of flexibility into consideration.

**2.4 Firm performance measurement**

This study has considered both financial (like ROE, ROA, ROI and profitability) and non-financial (process based) performance measures (Details can be found in appendix), and comprises of six intermediate process based measures and two other measures concerning with competitive dynamics and financial growth indicators.

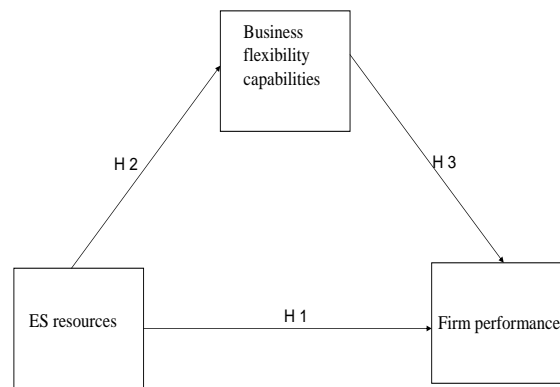
**III. RESEARCH HYPOTHESES AND MODEL**

This section develops hypotheses and explores three important relationships; Figure 1 shows the research model

**3.1 Enterprise systems (ES) resources and firm performance**

Engaging in enterprise systems is not necessary and sufficient condition for improving firm performance (Tallon, Kraemer et al. 2000; Carr 2003) however if used appropriately it can create intermediary effects by getting embedded into processes and streamlining business processes and improving decision making (Ravichandran and Lertwongsatien 2005). Every firm possesses resources, out of which only rare and valuable resources provide them with superior advantage and in order to sustain this advantage firms should protect these resources against imitation and substitution (Barney 1991). Taking this notion further, as ES resources are easy to duplicate they cannot provide firms with superior advantage over their competitors (Carr 2003; Karimi, Somers et al. 2007). Based on the above logic we propose our first hypothesis as:

H 1: There is very little association between ES resources and firm performance.



**Figure 1: Research Model**

**3.2 Enterprise systems (ES) resources and business flexibility capabilities**

Flexibility has emerged as a key competitive priority in many organisational activities including automation (Adler 1998), high technology manoeuvres(Evans 1991) , manufacturing (Weill 1992) and IT (Byrd and Turner 2001). When one review at the concept of flexibility it becomes evident that the concept of flexibility has a diversity of definitions and conceptualizations (Huber and McDaniel 1986; Allen and Boynton 1991; Duncan 1995; Nelson and Ghods 1998; Langdon 2006) for instance, De Leeuw and Volberda (1996) defined flexibility as the degree to which firm possess a variety of actual and potential procedures, and the rapidity by which it can implement these procedures to increase the control capability of management including controllability of the firm over its environment. Therefore, high flexibility corresponds to high control of a firm with respect to its environment (Krijnen 1979).

As mentioned in the beginning, the term flexibility has been used in many areas of management and in each area the definition is different but essentially it has readiness to change as a common element and. In the present study flexibility capability would be considered as “The capability of change readiness to adapt to new or changing requirements such as new business relationships, new product offerings, rapid sales growth etc”.

As the current business environment is increasingly getting characterized by increased velocity of change, flexibility has become a key competitive weapon for growth.(Byrd and Turner 2000; Byrd, Lewis et al. 2004; Langdon 2006; Karimi, Somers et al. 2007; Saraf, Langdon et al. 2007; Byrd and Turner 2001). ES solution providers increasingly promote flexibility as a major value proposition.

Also, as ES seamlessly integrate all aspects of the business to support all business strategies for better decision making and rapid response time, we hypothesize



**H 2: There is a positive association between ES resources and business flexibility capabilities.**

**3.3 Business flexibility capabilities and firm performance**

Merely engaging in ES resources is not necessary and sufficient condition for improving firm performance (Tallon, Kraemer et al. 2000; Carr 2003; Karimi, Somers et al. 2007) and in order to realize long term benefits resources have to be assembled so that they can create firm wide capabilities which in turn can increase firm’s performance (Clemons and Row 1991; Grant 1991; Mata, Fuerst et al. 1995; Makadok 2001).

As the basic essence of the existence of ES is to help the firms in better integration endeavors (Davenport 2000; Davenport, Harris et al. 2004) which in turn helps the firms in favorably adopting itself quickly to various available options and to respond to the needs of the dynamic competitive environment more effectively (Davenport 2000; Davenport, Harris et al. 2004). Also firms with higher levels of capabilities have higher levels of performance (Bharadwaj 2000; Saraf, Langdon et al. 2007) and in an environment significantly characterized by uncertainty and fierce competition, business flexibility capabilities of a firm can provide it with better performance. We therefore hypothesize

**H 3: There is a positive association expected between business flexibility capabilities and firm performance.**

Additional hypotheses related with all the hypothesis would also be tested on the basis of the various factors of business flexibility and firm performance after the factor analysis of the data obtained.

**IV. RESEARCH METHODOLOGY**

This section will discuss important aspects of this study

**4.1 Survey instrument**

In order to test research hypotheses data was gathered through the personal administration of the survey. Scale items of all the constructs were developed by following the Churchill (1979) methodology for scale development. Each item of the scale was selected for its appropriateness, uniqueness and ability to convey to respondents “different shades of meaning”. Scale items were developed that would measure the extent to which a firm has realized the ES functionality of various modules in their firms, business flexibility and firm performance. On the basis of the extensive literature review and on the basis of field interviews, 132 item were generated, this combined list of items were again critiqued by experts which resulted in 93 items. Field interviews conducted during this phase served helped in gathering insights about prevailing ES resources, flexibility and firm performance in ES manufacturing context. It also helped in defining and refining the construct domain, in items identification and specifications, in providing with practical recommendation regarding data collection, qualitative refining of research model and hypothesis, and in the overall development of the instrument, A five point Likert scale is used for all the items (Saraph, Benson et al. 1989). Constructs and associated indicators in the measurement model, as well as prior research support, are listed in Appendix 1.

**4.2 Unit of analysis and Sampling Process**

This study has firms as the unit of analysis, in each firm two respondents responded to the questionnaire, one senior most IT/IS executive and other was senior most business executive who responded to questions related to firm performance, since these two executives are very senior executives they were expected to have the best knowledge about the various aspects. The use of two executives also ensured the reduction of bias (Pinsonneault and Kraemer 1993). Based on the recommendations from the practitioners and academicians, the sample firms were selected from the list of top 500 Indian firms published by Economic Times who rates the firms on the basis of important financial and market based parameters. From this list those firms were filtered out belonging to Infotech, financial and banking and final data was collected from 53 manufacturing firms across the country with over all response rate of 12.5%.

**4.4 Data collection**

The data collection exercise was carried out through personal administration of the survey instruments after taking the prior permission of firms and in total 53 survey responses were collected with a response rate of 12.5% which is less than the recommended rule of thumb baseline minimum of 20 percent for empirical studies (Malhotra and Grover 1998) although several other studies subscribe to the philosophy that there is no generally accepted minimum response rate (Fowler 1993). The response rate of about 10 percent is also acceptable in case of research in information management (Miles and Huberman 1984; Ray, Mulhana et al. 2005). The entire exercise of data collection took 9 months and met the minimum number of sample size (50) needed for factor analysis (Hair, Anderson et al. 1998). Table I and II represents the overall job titles and work experience of senior IT executives.

**Table I: Job titles of Senior IT executives**

Job Title	Number
CIO/ VP	27
Senior managers / IT heads	26
Total	53

**Table II: Total Experience of Senior IT executives**

Up to 10 years	6
From 10 to 15 years	16
From 15 years to 20 years	14
From 20 to 25 years	13
Beyond 25 years	4



**Table III: Duration of ES implementation**

From 2 to 4 years	6
From 4 to 6 years	16
From 6 to 8 years	14
From 8 to 10 years	13
Beyond 25 years	4

Regarding business executives all of them are CEO's, CFO's or VP-Finance with work experience of more than 15 years.

**4.5 Operationalization and measurement of Constructs**

Prior research on ES implementation suggests that measures used to operationalize the extent of implementation may vary depending on researchers objectives and the nature of implementations (Karimi, Somers et al. 2007), presently we are measuring ES resources by the implementation extent of its functional scope that is, it is a measure of the range of implementation project and by summation of the number of business functions divided by total number of resource items so as to arrive at a cumulative score for resources for each case. Business flexibility capability is measured along two dimensions namely technical flexibility and organisational and managerial flexibility, firm performance was measured along eight dimensions, all 3 constructs were captured on five point Likert scale.

**V. DATA ANALYSIS**

Prior to data analysis cronbach's alpha test was carried out to measure the internal consistency of the scale items and alpha value was found to satisfy the minimum acceptable criterion of coefficient alpha is 0.7 (Churchill 1979). Exploratory principle component analysis using maximum-likelihood extraction and varimax rotation with Kaiser normalization was performed on the data to examine the dimensions underlying the research constructs. Items with loadings lesser than 0.40 and items with serious cross-loadings on more than one factor were removed. Initial unidimensionality and discriminant validity was checked by exploratory factor analysis (McDonald 1981; Hattie 1985). The results of this analysis appear in Table IV and evaluation of the correlation matrix through the KMO and Bartlett's test resulted in high KMO statistics (ranging from to .69 to .86 ) and a significant probability level (p , 0:001) for the Bartlett's test of all constructs. The items largely loaded into their respective factors, for financial performance and competitive dynamics the items loaded into the single factor.

The research model and the hypotheses presented earlier were examined using a manifest variable method, for hypothesis testing ordinary least square regression analysis were done.

**5.1 Determining the factor structures**

Factor analysis of business flexibility and performance yielded two factors for business flexibility and six factors for firm performance, the total variance explained by the two factors of business flexibility was 72% and coefficient alpha for these two factors were respectively .91 and .79 respectively, similarly for the six factors yielded for firm performance the total variance explained was 70% and coefficient alpha for all these factors were respectively .916, .850, .777, .764, .750, and .729 (The table containing the details of item loadings can be found in the appendix 2).

**Table IV: KMO, Bartlett's Test and Cronbach's alpha Test Result**

Name of the test	ES Resources	Business Flexibility	Performance
KMO statistics		0.846053	0.695
Cronbach's alpha	0.884	Factor1- .913 Factor2- .793	Factor1 - .916 Factor2 - .850 Factor3 - .777 Factor 4 - .764 Factor 5 - .750 Factor 6 - .729
Total Explained variance		72%	70%

**5.2 Testing of hypotheses**

This section presents findings and analysis of hypotheses 1 - 3 proposed earlier. Based on the initial data and analysis resulting in emergence of various factors some additional hypotheses associated with the main hypothesis would also be tested.

**Testing of additional sub hypotheses with respect to hypothesis 1:**

- H1a - ES resources are not positively associated with financial performance and competitive dynamics.
- H1b - ES resources are not positively associated with process planning and support.
- H1c - ES resources are not positively associated with production and operations.
- H1d - ES resources are not positively associated with supplier relations (inbound logistics).
- H1e - ES resources are not positively associated with customer relations.
- H1f - ES resources are not positively associated with product and service enhancement.

**H1a to H1f** were tested for three different groups- group 1, group 2 and group 3 for over all firms. Firms were segregated on the basis of two equal groups on the basis of overall ES resources scores. For group 1, those firms were taken which have over all resources less than mean score, For group 2, those firms were taken having over all resources greater than mean score (mean score was found to be 3.4).

These hypotheses results are presented in table V.



**Table V: Detailed results of first hypotheses**

Indvar	DepVar	Grp-1< 3.4			Grp-2> 3.4			Grp-3(Over all group)		
		R <sup>2</sup>	F Value	Sig Level	R <sup>2</sup>	F Value	Sig Level	R <sup>2</sup>	F Value	Sig Level
ES resources	Financial Performance & Competitive dynamics	0.001	0.031	0.862	0.004	0.105	0.748	0.008	0.42	0.52
ES resources	Process Planning and Support	0	0	0.986	0.087	3.014	0.084	0.015	0.787	0.379
ES resources	Production and Operations	0.037	0.809	0.379	0.008	0.221	0.642	0.095	5.349	0.025
ES resources	Supplier relations	0.01	0.215	0.648	0.001	0.031	0.861	0	0.001	0.979
ES resources	Customer Relations	0.037	0.8	0.381	0.058	1.725	0.2	0	0.009	0.924

It is evident from the above table that ES resources are largely not positively associated with the various factors of performance except for one. Based on the above results it can be concluded that ES resources are not positively associated with firm performance. Hence our first hypotheses got accepted.

H2b: ES resources are expected to be positively associated with organisational and managerial business flexibility capability.

The above two stated hypotheses were also tested for three different groups- group 1, group 2 and group 3 for over all firms similar to the first hypothesis. These hypothesis results are presented in table VI.

**Testing of additional sub hypotheses with respect to hypothesis 2:**

H2a: ES resources are expected to be positively associated with technical business flexibility capability.

**Table VI: Detailed results of second hypotheses**

Ind var	Dep Var	Grp-1< 3.4			Grp-2> 3.4			Grp-3(Over all group)		
		R <sup>2</sup>	F Value	Sig Level	R <sup>2</sup>	F Value	Sig Level	R <sup>2</sup>	F Value	Sig Level
ES resources	Technical Flexibility	0.019	0.405	0.531	0.03	0.793	0.381	0.015	0.772	0.384
ES resources	Mgrl. and Orgnl. Flexibility	0.037	0.806	0.38	0.02	0.511	0.481	0.005	0.246	0.622

The results revealed that in none of the above group, ES resources are having positive association with business flexibility (p- values in each case larger than .05), hence our second hypotheses is over all rejected.

H3b: Overall business flexibility capabilities are positively associated with process planning and support.

H3c: Overall business flexibility capabilities are positively associated with production and operations.

H3d: Overall business flexibility capabilities are positively associated with supplier relations (inbound logistics).

H3e: Overall business flexibility capabilities are positively associated with customer relations.

**Testing of additional sub hypotheses with respect to hypothesis 3:**

H3a: Overall business flexibility capabilities (Combination of technical, organisational and managerial flexibility) are positively associated with financial performance and competitive dynamics.

H3f: Overall business flexibility capabilities are positively associated with product and service enhancement. The above six stated hypotheses were also tested for three different groups- group 1, group 2 and group 3 for over all firms similar to the first and second hypothesis. These hypothesis results are presented in table VII.

As business flexibility has two important and firm performance has six important underlying factors, we would test association of flexibility components together on each underlying factor of performance using multiple regression analysis with flexibility as independent variables and firm performance as dependant variables. The results are shown in the table VII below:-

**Table VII showing detailed results of third hypotheses**

Indep. Variables		Dep Var	Grp-1 <3.4			Grp-2 >3.4			Grp-3 ( Over all )		
			R2	F Value	Sg Level	R2	F Value	Sg Level	R2	F Value	Sg Level
Technical Flexibility	Mgrl. &Orgnl. flexibility	Financial performance & competitive dynamics	0.047	0.494	.788,.377	0.038	0.529	.749,.324	0.048	1.261	.552,.148
Technical Flexibility	Mgrl. &Orgnl. flexibility	Process planning &support	0.097	1.069	.733,.191	0.111	1.682	.088,.525	0.082	2.28	.114,.178
Technical Flexibility	Mgrl. &Orgnl. flexibility	Production & operations	0.053	0.556	.333,.841	0.183	3.019	.038,.189	0.133	3.835	.018,.205
Technical Flexibility	Mgrl. & Orgnl. flexibility	Supplier relations	0.336	5.05	.007,.609	0.073	1.067	.687,.162	0.129	3.693	.039,.096
Technical Flexibility	Mgrl. &Orgnl. flexibility	Customer relations	0.044	0.458	.404,.760	0.056	0.8	.545,.255	0.009	0.218	.944,.514
Technical Flexibility	Mgrl. and Orgnl. flexibility	Product and service enhancement	0.067	0.713	.279,.559	0.084	1.236	.158,.656	0.075	2.024	.056,.631

Analysis of the table reveal that in group 3, technical flexibility is having positive association with production and operations, supplier relations, and product and service enhancement factors of performance with p values in each of these factors of performance less than or equal to .50 (95 % confidence interval ). For group 1 technical flexibility is having positive association with supplier relations factor of performance and finally for group 2 technical flexibility is having positive association with production and operations

factor of performance. Looking at an overall picture for these hypotheses, it emerges that for group 1 hypothesis 4 partially supported, for group 2 hypotheses 3 partially supported and for group 3 hypotheses 3, 4 and 6 were partially supported for technical flexibility component of business flexibility.

On the basis of the results of all the three hypotheses, table VIII drawn below depicts the summary of the results.

**VIII: Summarised hypotheses results**

Hypothesis	Results
Hypothesis 1 – Enterprise system resources are not positively associated with firm performance.	Over all hypotheses supported.
Hypothesis 2- Enterprise system resources are positively associated with business flexibility capability.	Over all hypotheses rejected.
Hypotheses 3- Business flexibility capability are positively associated with firm performance.	Hypotheses partially supported.

**VI. DISCUSSIONS**

This study analyzed the variation in firm performance using resource based view for large Indian firms. Using ES resources and business flexibility capabilities a conceptual model firmly grounded in resource based view was developed which linked all three constructs together and

after that this model was empirically tested for 53 firms. The empirical testing of the hypotheses revealed that: ES resources are not positively associated with firm performance ES resources are not positively associated with

business flexibility and lastly technical flexibility is having positive association with few factors of performance hence this hypotheses concerning with the positive association between technical flexibility and firm performance is partially supported. It could be because as the surveyed firms are mostly large firms they might be having well developed and well evolved IT infrastructure in place (Broadbent and Weill 1993) supporting the firm and also as executives have become used to working on it, this component of flexibility is getting associated with performance.

## VII. CONCLUSIONS, LIMITATIONS AND FUTURE RESEARCH

**Research Implications:** The study results offer a first empirical support for the applied resource based view assumptions in the Enterprise systems literature and further strengthen the claim of resource based view literature that mere possession of Enterprise systems will not contribute towards improved performance. The study results provide further the opportunity to differentiate business flexibility capabilities and performance constructs. Results also demonstrate that Enterprise systems are not positively associated with business flexibility capabilities and technical component of business flexibility capabilities are positively associated with performance.

**Managerial Implications:** The present study provides several important implications for managers; this research explains why there are cases where many firms in spite of deploying ES end up without benefits. Secondly empirical results confirmed the concerns raised by some of the researchers and practitioners who believe that although as claimed that ES resources can bring a potential increase in efficiency but due to their inherent best business practices, the necessary standardization may come at the price of lower flexibility (Kumar and Van 2000; Themistocleous, Irani et al. 2001 ; Alshawi, Themistocleous et al. 2004; Bajwa, Garcia et al. 2004; Retigg 2007).

**Research limitations & future research directions:** Every study has its limitations. First, this study was based on a sample of companies covering India and some industries were slightly over- or under-represented. Future researchers should therefore try to verify the findings for other populations in other geographical parts. If similar results are found this would strongly support the pervasiveness of the resource based view. Moreover, the study uses cross-sectional survey data. Therefore, the interpretation of the cause-effect relationship between the constructs in the model must be made with caution. Consequently, longitudinal data is required to create further support from this perspective. Future research based on case studies could also provide rich data and would be especially valuable in exploring whether and how buyers can combine and even leverage supplier activities of different rent-based supplier management approaches. Finally, given the length constraints of a survey other indicators belonging to a specific rent-based supplier management approach have been not included. Recognizing this limitation future research may refine both our conceptual definitions and the measurement model scales for the constructs. Such incremental refinement is in the tradition of cumulative

research that others could build on and extend the findings reported in this research.

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**Appendix 1: Comprising of main constructs its indicators, description and literature support**

**A) Items for Enterprise Systems Resources Construct :** i) Document management module (ii) CRM module (iii) Project Management module (iv) Business Intelligence module (v) Financial accounting module (vi) Human Resources module (vii) Reports Management module (viii) Reports Management module (ix) Sales and Distribution module (x) Plant maintenance module (xi) Quality Management module (xii) Production Planning module (xiii) Material Management module (xiv) Costing and Controlling module (xv) Group ware and online technologies (xvi) Mobile devices (xvii) Internet /e mail (xviii) Legacy systems

**B) Items for Business Flexibility Capabilities Construct:**

Construct	Definition	References
1. Business process management skills. This was measured by the help of 7 items	It reflects a deeper understanding of change in business operations and impact of any particular action/decision on entire firm	(Cohen and Levinthal 1990), (Stratman and Roth 2002), (Karimi, Somers et al. 2007)
2. Functional and knowledge skills. This was measured by the help of 8 items	It reflects readiness to implement and maintain enterprise system s/w in support of business.	(Byrd, Lewis et al. 2006), (Stratman and Roth 2002), (Byrd and Turner 2000; Byrd, Lewis et al. 2004; Byrd, Lewis et al. 2006; Byrd and Turner 2001)
3. Business –IT alignment. This was measured by the help of 4 items	It refers to a process used to align IT capabilities with the cross functional business requirements of enterprise.	(Miller and Cardinal 1994), (Lederer and Sethi 1996), (Ferguson, Cooper et al. 1997),
4. Executive commitment. This was measured by the help of 2 items. This was measured by the help of 4 items	It refers to the management change readiness and its willingness to advocate ERP with in the organization and allocate resources acquired for successful ERP.	(Miller and Cardinal 1994), (Lederer and Sethi 1996), (Ferguson, Cooper et al. 1997),

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5.Change management skills. This was measured by the help of 4 items	It reflects the employees involvement and communication strategies to manage and over come work force resistance to ERP related changes.	(Huber and Glick 1993), (Karimi, Somers et al. 2007)
6. Architecture infrastructure flexibility. This was measured by the help of 3 items	Change readiness of existing IT infrastructure to go for proposed changes as and when required.	(Byrd, Lewis et al. 2004; Byrd, Lewis et al. 2006)

### C) Items for Firm Performance Construct:

Construct	Definition	References
1. Process planning and support. This was measured by the help of 6 items	Is the extent to which the ES improves planning and decision making by improving organizational communication and coordination and by enhancing Organizational flexibility.	(Tallon, Kraemer et al. 2000; Tallon and Kraemer 2007).
2. Supplier relations (Inbound logistics). This was measured by the help of 6 items	Is an extent to which ES helps in supplier coordinating linkages and helps in reducing the search costs.	(Mukhopadhyay 1995), (Tallon, Kraemer et al. 2000; Tallon and Kraemer 2007).
3. Production and operations. This was measured by the help of 8 items	Is an extent to which ES helps in improving the production processes leading to an improvement in economies of scale in the delivery of products and services?  ES enables in the greater ranges of the products and services	(Ives and Learmonth 1984),(Porter and Millar 1985),(Malone, Yates et al. 1987), (Banker, Kauffman et al. 1991), (Kelley 1994).
4. Product and service enhancement. This was measured by the help of 6 items	ES helps in production and development of new products and services.  ES helps products and services to be uniquely differentiated in variety of ways.	(Bakos and Treacy 1986 ),(Barua, Kriebel et al. 1995), (Tallon, Kraemer et al. 2000; Tallon and Kraemer 2007)
5. Sales and marketing support. This was measured by the help of 6 items	.In identification and serving of the new market trends.  Help to track market trends and responses to marketing programs.	(Porter and Millar 1985), (Tallon, Kraemer et al. 2000; Tallon and Kraemer 2007).
6. Customer relations (outbound logistics). This was measured by the help of 5 items	Is an extent to which an ES can establish, sustain and improve customer relationships	(Ives and Learmonth 1984),(Porter and Millar 1985),(Tallon, Kraemer et al. 2000; Tallon and Kraemer 2007).

7. Competitive dynamics. This was measured by the help of 5 items	This is an indicator of the extent to which ES helps in improving the competitive positioning of the firm.	(Tallon, Kraemer et al. 2000; Tallon and Kraemer 2007)
8. Growth in financial indicators. This was measured by the help of 6 items	This is an indicator of the extent to which ES helps in improving the various financial indicators.	(Harris and Katz 1989), (Alpar and Kim 1990 ), (Henderson and Venkatraman 1993), (Mahmood and Mann 1993)

**D) Detailed Literature review of IS resources and capabilities:**

Serial Number	Source title	Paper type	Findings	Comments on use of RBV	Paper
1	Sustaining IT advantage: The Role of Structural Differences.	Conceptual	IT cannot, in and of itself, lead to SCA, but may assist other resources in doing	Conceptual	(Clemons and Row 1991)
2	Strategic Context and Patterns of IT Infrastructure Capability	Empirical (survey)	More extensive IT infrastructure capability found in firms where products changed quickly and the implementation of long-term strategies was tracked over time.	More extensive IT infrastructure capability found in firms where products changed quickly and the implementation of long-term strategies was tracked over time.	(Broadbent and Weill 1993)
3	Information Technology and Sustained Competitive Advantage: A Resource-based Analysis Advantage	Conceptual	Out of four important IS resources mainly access to capital, proprietary technology, technical IT skills, and managerial IT skills. It is managerial IT skills which provide sustainable competitive advantage	Conceptual development. Logical rather than empirical arguments made for appropriateness of resources	(Mata, Fuerst et al. 1995)
4	Organizational Learning and Core Capabilities Development: The Role of IT	Conceptual	Looks at the role IT plays in developing capabilities within the firm and describes the role of IT within the context of organizational learning	RBV not measured	(Andreu and Ciborra 1996)
5	Develop Long-Term Competitiveness Through IT Assets	Conceptual	Defines three IT assets: IT human resources asset, technology asset, and relationship asset. These assets in combination with IT Processes lead to SCA.	Loosely based on the RBV and RBV not measured. No empirical work	(Ross, Beath et al. 1996)
6	Resource-Based Theory and a Structural Perspective of Strategy Applied to the Provision of Internet Services.	Conceptual	Uses RBV and structural perspective of strategy to develop a series of propositions about online information services ,divides resources into knowledge-based and property based types	This study hypothesizes that knowledge based resources are more valuable in online setting and no testing of hypotheses	(Lopes and Galletta 1997)
7	Information Technology as Competitive Advantage: The Role of Human, Business, and Technology Resources	Empirical (retail industry survey )	Supports the strategic necessity hypothesis. Finds that IT alone cannot produce SCA, but that IT can leverage other intangible, complementary human and business resources to gain SCA	Strong empirical content although RBV not measured directly	(Powell and Dent-Micallef 1997)
8	Catching the Wave: Alertness, Responsiveness, and Market Influence in Global Electronic Networks	Empirical	Uses an RBV framework to show that alertness and responsiveness lead to market influence in the global finance industry	Strong empirical work. SCA is not the main dependent variable. RBV not measured	(Zaheer and Zaheer 1997 )
9	An Information Company in Mexico: Extending the RBV to a Developing Country Context	Empirical case study	Mixed support for the RBV found in emerging country context.	RBV not measured directly. Resource attributes considered.	(Jarvenpaa and Leidner 1998)



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10	Information Technology Assimilation in Firms: The Influence of Senior Leadership and IT Infrastructures	Empirical (survey)	Looks at the influences of quality of senior leadership, sophistication of IT infrastructures and organizational size on IT assimilation.	Conceptual model only loosely based on the RBV. RBV is not actually measured.	(Armstrong and Sambamurthy 1999)
11	IT Capabilities: Theoretical Perspectives and Empirical Operationalization	Empirical	Describes the formation of an IT capability construct with six elements: IT business partnerships, external IT linkages, business IT strategic thinking, IT business process integration, IT management, and IT infrastructure.		(Bharadwaj, Bharadwaj et al. 1999)
12	Strategic Context and Patterns of IT Infrastructure Capability	Empirical (survey)	More extensive IT infrastructure capability found in firms where products changed quickly and the implementation of long-term strategies was tracked over time.	More extensive IT infrastructure capability found in firms where products changed quickly and the implementation of long-term strategies was tracked over time.	(Broadbent and Weill 1993)
13	Resource view theory analysis of SAP as a source of competitive advantage for firms	Conceptual	Explores whether SAP could be considered a determinant of SCA in the RBV sense. Determines that it could, if managed properly	Non empirical	(Pereira 1999)
14	Building Competitive Advantage Through Information Systems: The Organizational Information Quotient	Conceptual	Develops a series of success components through which IS can lead to SCA. Evaluation of these components leads to an organizational information quotient.	Non-empirical	(Service and Maddux 1999)
15	A Resource-Based Perspective on Information Technology Capability and Firm Performance: An Empirical Investigation	Empirical (archival data, matched pairs)	Performance of firms which are rated to have superior IS capability in magazine survey compared to firms which do not. Performance of superior IS capability firms found to be higher.	Strong conceptual development of IS capability construct. Construct measures not used, however, in empirical analysis.	(Bharadwaj 2000)
16	Membership Size, Communication Activity, Sustainability: A Resource-Based Model of Online Social Structures	Empirical	Uses RBV to look at online social structures. Finds complex relationships between membership size, communication activity, and online structure sustainability.	Uses resource-based logic to frame conceptual arguments. Develops notion of sustainability. Does not operationalize resources using resource attributes.	(Butler 2001)
17	Information Technology, Core Competencies, and Sustained Competitive Advantage	Conceptual	Argues that IT infrastructure flexibility yields sustained competitive advantage as an enabler of firm-specific core competencies.	Conceptual based paper	(Byrd and Turner 2001)
18	Sustaining Strategic IT Advantage in the Information Age: How Strategy Paradigms Differ by Speed	Conceptual	Argues for a strategic model that differentiates among IS types. IS strategy should depend on the length of the product cycle (ecologies).	Attempts to extend the RBV to make it more useful in quantifying sustainability of competitive advantage.	(Hidding 2001)
19	Beyond Sabre: An Empirical Test of Expertise Exploitation in Electronic Channels	Empirical	Finds that RBV is more effective than Transaction Cost Economics at explaining the creation of expertise. Finds technology lock in not effective.	Constructs not explicitly operationalized as resources.	(Christiane and Venkatraman 2002)

20	Impact of Information Systems Resources and Capabilities on Firm Performance: A Resource-Based Perspective.	Empirical	Examines complementarity from a resource-based perspective. Finds preliminary support for the relationship between IT and non-IT firm capabilities in achieving superior firm performance.	IS capability measures (unspecified) used in analysis	(Ravichandran and Lertwongsatien 2002))
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