

# Impact of ERP Adoption and Utilisation on Supply Chain Performance in Pharma Industry

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**Abstract**— In modern era technology is growing very fast, Enterprise Resource Planning (ERP) is subpart of technology and organizations are facing stiff competition in the market. Implementation of ERP has become one of the major problems as to which software is best fit for firms where there is a variety of software available in the market. Much research has been done but it is hard to conclude which software is the best for all in the software world. So, this research has aimed out that for the improvement of supply chain how ERP adoption, vendor selection can play vital role by utilization of technology and make fruitful results. Furthermore, statistical tools have been used to predict results like Factor analysis and Mediation test. This study is quantitative in nature and based on a survey (Questionnaire), the data is collected from software consultants and specialists. Results have shown that ERP adoption has a significant impact on supply chain performance. There was just one direct impact that proved insignificant, that is vendor selection's impact because in mostly software consultant companies work on just one software like Oracle, SAP etc. That is why they don't consider vendor selection as an important factor for supply chain performance.

**Keywords**— Supply Chain Performance, ERP Adoption, ERP Utilisation, Pharmaceuticals, Organisational Performance

## I. INTRODUCTION

Supply Chain Performance required integration of ERP system that provides competitive advantage and make organizations enable to meet customer expectations [1]. ERP and Supply chain management act as a useful tool that proves fruitful for organization's performance. [2] shared that although there is a progress in deployment of Enterprise resource planning in organizations in last two decades but if we see the complete deployment of ERP system that is under-progress. There are some companies that have a verified reason and motive for adoption of technology such as Enterprise resource planning, whereas those organizations are more geared up to adopt technology.

The high financial and other resources in the ERP operation procedure requires vigilant thought about numerous issues at the implementation and taking on phases [3]. [4] shared that CSF (Critical success factor) is used as a list of options that leading on the way to good or bad results of ERP projects. On the other hand, test has shown that from approx. three decades there have been a multiple CSFs found, whereas some researchers had found it separate and others differently, except these challenges there are inside factors that impact CSF [5].

The objective of this study is to examine the impacts of Enterprise resource planning system and utilization of ERP on supply chain Performance. There are companies who get competitive advantage through ERP performance so that it is the best way towards automation and integration [6]. [7] shown that ERP selection has been developed through multiple factors including qualitative and quantitative as well because grey model is used here for implementation of multiple criteria for the implementation of ERP.

This study follows to cover Supply chain performance through ERP adoption, through indirect impact of ERP Utilization where organization can reduce chances of failure by evaluation of ERP before implementation that is very useful output for the companies which want to implement but be afraid of failure.

## II. LITERATURE REVIEW

### A. Theoretical Background

Recent studies guided that ERP modules are associated with each other to provide access each user to find information throughout every department of organization on the other hand, major modules include Sales, Financial, H.R, Production, Order Management and S.R.M. for instance, customer related information is found in sales and distribution module, nevertheless [8]. ERP gives integrated system that provides same information across all divisions of organization whereas ERP cut down cost and give improvement to management decisions. ERP software is most difficult and requiring information system it has got fame due to its ability to reduce cost and provide a very useful tool to management for decision making.

Enormous investment is done to make an ERP system, where company look for supply chain integration throughout business entities and markets [9]. It is thought that ERP system can work as trigger for immediate data sharing and integration [10]. The high financial and other resources in the ERP operation procedure requires vigilant thought about numerous issues at the implementation and taking on phases [3]. Currently, threats in ERP implementation has become multiple because of linking technological and financial resources [11]. Organizations meet no of disputes due to various grounds as now World has become a global village, hopes and requirements of customers are high, Outsourcing and so on [6]. Different enterprise resource planning (ERP) systems are measured as a foundation to facilitate the majority companies to

achieve their business goals. Research studies shown that adoption of a complex IT system is dissimilar than an ERP system as ERP is intrinsically difficult, naturally integrated, huge resources, other risk level, are normally not modified and demand various company capabilities to function and sustain them [3]. In first sight the low implementation rate can be recognized to complexities in computing fruits and huge infrastructure and execution cost [12]. An earlier glance tells further obstacles. The difficulty of genuine world difficulties often has been undervalued thus to facilitate the modern optimization models could not accomplish the users' prospect [13].

Study on Return on investment (ROI) in deployment of ERP software is mainly emphasized on operational and financial paybacks, if we take it in operational paybacks, ERP software has been recognized in minimizing cycle time, better outcomes of customer services and SRM [14]. Deployment of ERP demands important straight financial investment. Enterprise resource planning (ERP) contains multiple modules software which facilitates companies to make more efficient their business procedures. The collapse of various ERP may be because of severe challenges come upon throughout ERP system implementation [15], [16]. When there is a modification in system occurs and end users determine to take on changing environment or oppose, this depends on the analysis of characteristics launched in the IT Infrastructure: Indeed, the most important reason of unsuccessful implementation of system has been the opposition of end users [17].

#### *B. Empirical Reviews – ERP Adoption and Selection*

Researchers studied that data collection through multiple ways like planned interviews and explanation with get-together and examinations of pre-implementation and post-implementation credentials further findings of the results has indication towards executor of ERP that consider the importance of parallel communication system for before and after deployment of ERP apart of that it also concludes that choice of post execution construction is normally result of negotiation [18]. In current era, it has become universal trend for organizations to spend for implementation of ERP. ERP implementation in an organization is difficult and the willingness to fit, uphold and control the system is said to be vital for ERP adoption accomplishment.

Studies revealed that Vendor choice contribute a critical part, as trustworthiness, technical specialization, monetary power and strategies in product designing of the ERP provider impacts on outcomes of organizations [19]. Selection of ERP software is a very critical step and structured over the expected business activities' results [20]. Marketable ERP software is not able to offer a single window for all the business divisions even for every industry. Hence, there is no ERP system that can complete all business functions even in all specific necessities of business. That's why organizations must select stretchy ERP software and a professional vendor that can meet successfully to demands of the consumer [21]. Similarly, studies on evaluation of proposed ERP software and its selection of an appropriate among them has become a very tough job [22]. Many specialists consider for the deployment of ERP system and its selection to study carefully every single side. Therefore, determination for most suitable ERP software is done through various parameters among the possible options. The market of ERP systems has influence of software monsters SAP, Oracle and various best-of-breed SCM vendors. ERP software vendors

influence long-standing plans of information technology of an organization and even have straight influence on organization's profitability. When organizations are confined to single ERP software it lifts complexities so organizations should invest for up gradation and development of a system [23]. ERP software vendors repeatedly fluctuate in their capability to get realistic way outs to business hurdles [9]. ERP vendor selection has proved an important step, and depends on the projected results of business procedures, different software have separate features, it requires extra carefulness on different parameters, as well as software fitness for the business atmosphere, alliance of strategies, services of vendors, and abilities of software [20].

Enterprise resource planning play an important role in getting consistent competitive advantage and improved organizational performance. ERP system shows the way to the development in the working environment and usage of system easily [24]. Empirical studies as case studies and surveys have been practiced evaluating the effect of ERP software on supply chain management [14], [25]. Nevertheless, these procedures have proved insufficient for measuring SCM performance throughout multiple companies' atmosphere. Financial outcomes can be resulted by trade fluctuations, return to shareholders, and different ways in supply chain. These public monetary data have been practiced getting healthy and organized evaluation of the impacts of ERP software deployment [26].

#### *C. Summary of Reviewed Literature*

With reference to above mentioned literature review it can be stated that ERP is a critical part of every business today and this is the thing on the basis of organizations getting competitive advantage and improving their performance whereas ERP adoption based on multiple factors such as resources, capabilities, suitable, best fit and many more to go and ERP vendor selection has become challenging job for business analyst because they have to consider all aspect while selecting any ERP and there are multiple options in the market mainly SAP, Oracle (EBS), People soft and Microsoft Dynamics and Software wise there are certain characteristics as SAP is very good for Manufacturing whereas Oracle has strong financial that's why we see Oracle in banks and financial institutions mostly except this people soft has strong H.R module although oracle has acquire people soft as well and we see different customized software in small industries and even in financial institutes where they cannot afford such a giant cost of these software's.

Studies has shown that ERP has greater impact on supply chain performance so today organizations enjoying competitive advantage through proper ERP selection and its utilization so we can say that right ERP selection can provide us greater benefit and high ROI. Moreover, In today competitive era we have to go with the world so day by day The world is going towards automation and systematic working instead of working on traditional systems so in such a scenario it is hard to compete in market and technology as well where ERP is one of the tool that give us competitive advantage and update our working style with the passage of time so the selection of best fit system for the particular industry it has multiple aspects and require a brief business analysis to make it successful and make it possible to meet projected milestones. From literature review following research questions has been developed to further develop the understanding on the research area:

- Q1. What is the impact of ERP adoption on Supply Chain Performance?
- Q2. What is the impact of ERP utilization on Supply Chain Performance?
- Q3. What is the indirect impact of ERP adoption on supply chain Performance?

There exist many studies where people have seen ERP's impact on Supply chain Performance by skipping ERP implementation and its selection that is one of the critical jobs as what is best fit for organization and how it can be made a result oriented project but I found flaw at this area so I am trying to find out some results in this direction where we can extract some data regarding ERP adoption.

### III. THEORETICAL FRAMEWORK

The framework as shown in figure 1, is developed to find how ERP adoption impact the supply chain performance and how this ERP utilization impact the performance of the firm. Moreover, moderating impact of ERP utilization among the ERP adoption and supply chain performance. TOE framework has been developed in 1990 [27]. It explains three aspects of an organization that is Technological context, Organizational context and environmental context. In Technological context internal and external aspects are considered while studying an organization that consists of existing practice and internal equipment, whereas organizational aspects refer to descriptive measures related to firm like scope, size and management structure on the other hand, Environmental context is the way in which an organization carry its business and its industry and competitors. TOE framework has been adapted in IT adoption related studies that proved useful framework for evaluation of adoption and absorption of multiple innovations of IT and it has strong theoretical basement further many ERP studies used framework of T.O.E to support their work so T.O.E framework is suitable, healthy enough and leading when the organization's level adoption is being studied [28].

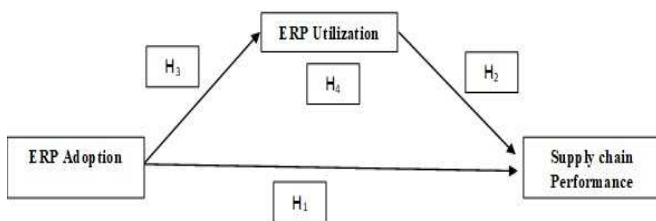


Fig. 1. Theoretical Framework.

#### A. Research Design and Hypothesis

Referring to study of [29] it is noted that in previous studies relationship between ERP adoption and organizational performance in broad where organizational performance due to misalignment of the system competencies. Further system usage has mediating impact with ERP adoption and organizational performance. Apart of that user satisfaction also has mediating relationship with ERP adoption and organizational performance. Selection of ERP vendor has different supply chain results for organizations especially for those who are implementing major ERP like SAP and Oracle [30]. Referring to the literature reviews stated above (Figure 1) the following set of hypotheses are to analyse the questions that whether the ERP adoption affect the Supply Chain

performance, after expressing the problem following hypothesis has been extracted:

- H.1. There is a significant impact of ERP Adoption on Supply Chain Performance
- H.2. There is a significant impact of ERP Utilization on Supply Chain Performance.
- H.3. There is a significant impact of ERP Adoption on ERP Utilization.
- H.4. There is a significant mediating impact of ERP Utilization on ERP Adoption and Supply chain performance.

This quantitative study is based on survey and is cross sectional study, the samples are taken from Pakistani companies by using Nonprobability purposive sampling procedure. However, four hypotheses have been tested as mentioned above with the name of hypotheses. Further this study focusing on measuring the impact of ERP adoption mediating impact on supply chain Performance through ERP Utilization. Design of Research is mainly based on the Research type [31]. Research type can be qualitative or quantitative or mixed it depends upon the problem to be addressed in the study; these approaches are different in terms of nature of the data. While qualitative research data consists of words, symbols, photos, sentences and observations. On the other hand, quantitative research data consists of numbers [32]. Mixed research consists of both qualitative and quantitative approaches [33].

Quantitative research design is best for appropriateness whenever investigation is carried among variables, for applying theories, Hypothesis and models [32]. [34] suggested that quantitative research design is best for association among variables and it I one of the most fit ways for hypothesis testing. Nevertheless, organization has been selected as a unit of analysis whereas the sample is the consultants and supply chain professionals.

#### B. Research Overview and Analysis

Type of this study is causal and quantitative in nature because this can be the most suitable approach to determine the empirical relationship among and between the variables. Whereas the problem is not common but have studied once so the adopted model is already developed and tested but not yet in Pakistani context. The data is collected through cross-sectional survey research tactics which contain a structured questionnaire to verify the responses. The dependent variable is Supply chain performance on the other hand mediator is ERP utilization and independent variable is ERP adoption, so the unit of analysis is organization (managers/employers of Operations department and supply chain professionals).

A convenience sampling technique has been used and collected sample of 161 which have been used to attain the data. The advantage of this method is that those people who are convenient to approach can be contacted related to different industry through convenience technique this required sample size can be done in the shortest time with minimum cost. Data has been collected from the respondents related with operations and supply chain only, preferably from those who are engaged in ERP adoption, Utilization and performance.

Data has been collected through structured questionnaire. The questionnaire is developed from the following source for which reference is [35]. Each item on a scale anchored on Likert scale, from 1 to 5 indicating 1 "Strongly Disagree" and 5

“Strongly agree”. To collect the data, a Questionnaire has been developed and distributed to the sample. To attain the reliable data focus is on designing the questionnaire which should be simple and easy to understand. The focus is also made to get the data from actual respondents i.e. (middle and top management) from ERP consultants, professionals & users. Methods adopted by [37] is used to examine the data and the indirect relationship is examined by using SPSS 21 versions used for analysing the data.

### C. Result and Findings

The data is collected through questionnaire. Employees related to production, operations, supply chain and ERP users are contacted and to get more precise results middle and top management personal are communicated, in conducting this research almost 800 plus individuals from different manufacturing firms has been approached, out of which 161 responses has been collected, this number is reduced to 151 because of a few missing values and outliers. The respondents were contacted via different forums and personal visits. The response rate is around 20%. Correlation enumerates the relationship between the variables and level of relationship either strong or weak or weak and positive or negative relation.

TABLE I. ERP Adoption: Mean, SD & ERP Adoption Correlation

	Mean	Std. Dev	ERPAD2	ERPAD3	ERPAD4	ERPAD5	ERPAD6	ERPAD7
ERP AD1	3.7	.940	.566	.554	.472	.445	.407	.488
ERP AD2	3.4	1.00		.681	.453	.594	.587	.568
ERP AD3	3.2	.996			.552	.591	.559	.621
ERP AD4	3.4	1.07				.606	.587	.528
ERP AD5	3.3	1.02					.652	.627
ERP AD6	3.4	.996						.535**
ERP AD7	3.2	1.10						1

\*\* Correlation is significant at the 0.01 level (2-tailed). (at 99% confidence level).

- Absolute value of 0.00-0.09 means no correlation
- Absolute value of 0.10-0.29 means Low/weak correlation
- Absolute value of 0.30-0.49 means medium correlation
- Absolute value of 0.50-1.00 means strong correlation.

Since we took the mean and standard deviation among items so the results revealing that the overall mean is in between 3 to 3.5 whereas standard deviation .99 to 1.1. Since the value of Pearson Correlation in ERP adoption is mostly in between strong and moderate that’s why we can say that the overall relationship among items is somehow strong.

TABLE 2. ERP Utilization: Mean, SD & ERP Utilization Correlation

	Mean	Std. Dev	ERPU2	ERPU3	ERPU4	ERPU5
ERP U1	3.29	1.388	.310**	.363**	.406**	.337**
ERP U2	3.77	1.144		.456**	.391**	.333**
ERP U3	3.55	1.069			.697**	.609**
ERP U4	3.51	1.107				.625**
ERP U5	3.54	1.018				1

Since we took the mean and standard deviation among items so the results revealing that the overall mean is in between 3.2 to 3.77 whereas standard deviation 1.0 To 1.3.

Since the value of Pearson Correlation in ERP Utilization is mostly moderate that’s why we can say that the overall relationship among items is somehow moderate.

TABLE 3. Supply Chain Performance Correlation

	Mean	Std. Dev	SCMP2	SCMP4	SCMP5
SCMP1	2.85	1.174	.562**	.463**	.425**
SCMP2	2.95	1.060		.405**	.381**
SCMP4	3.21	1.062			.647**
SCMP5	2.99	1.119			1

Since we took the mean and standard deviation among items so the results revealing that the overall mean is in between 3 to 3.5 whereas standard deviation .99 to 1.1. Since the value of Pearson Correlation in Supply chain Performance is mostly in between strong and moderate that’s why we can say that the relationship among items is somehow strong.

### D. Exploratory Factor Analysis

Cronbach's alpha shows the reliability of the variables as per the standards, .7 is the acceptable reliability value and less than .7 is questionable. Reliability which is more than .7 help to find the better results. Table 3 results illustrate the reliability statistics of individual variable and value of Cronbach’s alpha of each variable. Reliability tables shows that all the variables are reliable and have the Cronbach’s alpha value greater than 0.7. Reliability for the variable ERP adoption has 7 items, has a value of 0.897 that means 89.7% data is reliable. Reliability for ERP utilization has 5 items, has a value of 0.818 that means 81.8% data is reliable. Reliability for variable supply chain performance has 4 items, has a value of 0.787 that means 78.7% data is reliable.

TABLE 4. Exploratory Factor Analysis

KMO and Bartlett's Test = 0.856

Bartlett's Test of Sphericity (1446.187) = 0.000				
	Cronbach Alpha	Component		
		1	2	3
ERPAD1		.665		
ERPAD2	<b>0.897</b>	.787		
ERPAD3		.776		
ERPAD4		.747		
ERPAD5		.800		
ERPAD6		.790		
ERPAD7		.735		
ERPU1			.679	
ERPU2	<b>0.818</b>		.589	
ERPU3			.776	
ERPU4			.821	
ERPU5			.717	
SCMP1				.764
SCMP2	<b>0.787</b>			.722
SCMP4				.797
SCMP5				.777

Extraction Method: Principal Component Analysis.  
 Rotation Method: Varimax with Kaiser Normalization.  
 a. Rotation converged in 5 iterations.

There are two main objectives of Factor Analysis:

- Cut the data to combine same characters and variables.
- Reveal dimensions of data that were hidden.

There has been used interval scale and Ratio reason is in factor analysis we just take the quantitative variables. The factorability of 16 variables has been examined where found Kaiser-Meyer-Olkin's value 0.856 that is than the value recommended of 0.5 therefore it has shown appropriateness of test.

**Bartlett's test of sphericity was significant ( $c^2 = 1446.187, P < 0.05$ )**

So, by performing exploratory factor analysis that revealed three hidden dimensions those dimensions consist of ERP Adoption (ERPAD), ERP Utilization (ERPU) and Supply Chain Performance (SCMP).

DV = SCMP      IV = ERPAD      MEDS = ERPU

TABLE 5. Mediation Test

	Direct Effect	Indirect Effect	Total Effect	P-Value
ERPAD to ERPU (a path)	0.6857		0.6857	0.0000
ERPU to SCMP (b path)	0.2420		0.2420	0.0039
ERPAD to SCMP (c, c' path)	0.2873	0.1659	0.4532	0.0024
R <sup>2</sup>	0.2377			
Adj-R <sup>2</sup>	0.2274			
Sig.	0.0000			
Lower	0.0678			
Upper	0.2907			

- P=significance level, if P is less than 0.05, it is significant
- The path from ERPAD to ERPU is significant  $p = 0.0000$ , so it accepts our hypothesis H3

- The path from ERPU to SCMP is significant  $p = 0.0039$ , so it accepts the hypothesis H2
- The path from ERPAD to SCMP is significant  $p = 0.0024$ , so it accepts the hypothesis H1.
- The zero does not occur between upper and lower value which proves that indirect effect is significant. So that it accepts the hypothesis H4
- R Square value in this case 0.2377 is the amount of variance in the DV accounted by the IVs and MedVs.

TABLE 6. Hypothesis & Analysis Summary

Hypothesis	Significant/ Insignificant
There is a significant impact of ERP adoption on Supply Chain Performance	Significant
There is a significant impact of ERP utilization on Supply Chain Performance.	Significant
There is a significant impact of ERP adoption on ERP Utilization	Significant
There is a significant mediating impact of ERP adoption on Supply chain performance	Significant

#### IV. CONCLUSIONS AND DISCUSSIONS

First, considering impact of ERP adoption on supply chain performance is significant which proved that adoption of ERP is very fruitful to get improved supply chain performance. There is no ERP system that can complete all business functions even in all specific necessities of business [36], that's why organizations must select best fit ERP software and a professional vendor that can successfully meet the demands of consumer [21]. ERP adoption has different scenario as compared to technology as parameters are different with reference to above mentioned theory that [3] said that adoption of a complex IT system is dissimilar than an ERP system as ERP is intrinsically difficult, naturally integrated, huge resources, other risk level, are normally not modified and demand various company capabilities to function and sustain them. In first sight the low implementation rate can be recognized to complexities in computing fruits and huge infrastructure and execution cost [12]. An earlier glance tells further obstacles. The difficulty of genuine world difficulties often has been undervalued thus to facilitate the modern optimization models could not accomplish the users' prospect [13]. ERP software has become essential part of an organization as world is growing so fast so being in the market, we must be fast as market but to find best fit for your benefit is the real challenge that organizations face so for that they hired consultants and other experts who recommend best fit software whereas even in small retails stores are using this technology including bar code technology, RFID etc.

Furthermore, any kind of change in organization is the most critical challenge for management so the ERP is one of the changes that people react against it sometime very offensively so ERP implementation is not about technology but beyond this it is change management, a new journey towards success or may be a re-engineering. So, ERP implementation has multiple aspects that need to be in focus while doing implementation and one of the things that can give competitive advantage in your industry or beyond this.

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