

ERP Success and Logistical Performance Indicators A Critical View:

Fareed ud din¹, Saroop Anwer²

¹ Department of CS & IT, Superior University,
Lahore, Punjab, Pakistan

² Department of Management Sciences, Superior University
Lahore, Punjab, Pakistan

Abstract

This study extracts the literature based study on Critical Success Factors (CSF's) in Enterprise Resource Planning (ERP) Implementation, focusing on Supply Chain (SC) Logistical Performance Indicators. The originality of this study is to make clear identification of CSF's in term of ERP system implementation and the impact of Supply Chain Logistical Performance. A subsequent analysis highlights the gaps in the literature which was needed to be addressed. The key finding of the study is that the most of the observers, researches and management personnel's have been involved in considering the CSF's identification in general; hence no clear identifications exist for how much logistical performance is important for a manufacturing organization and up to which extent effective ERP system may include logistical features. While implementing ERP in an enterprise(s), it is found that there are obviously some factors in parallel with the promising features which need to be pointed out for successful implementation. A bulk of literature studies on ERP was reviewed and studied in depth, for CSF's identification and framework for a sound and fortified implementation of ERP system. The assemblage of the CSF's is being analyzed in specific terms of ERP implementation in developing countries and in term of logistical performance. This study reveals the relationship of an effective ERP system with logistical performance management.

Keywords: ERP (Enterprise Resources Planning), Barriers, SC (Supply Chain), Critical Success Factors (CSF's), Logistical Performance Management, Implementation.

Introduction

The development of Enterprise Resource Planning (ERP) software packages during the past decade has turned the enterprise software market into one of the industry's hottest and booming area of peak [1], [9]. Unfortunately, many ERP systems have not lived up to their promises [2]. Enterprise Resource Planning (ERP) packages have transformed the way organizations go about the process of providing information systems. Enterprise Resource Planning (ERP) systems help to manage company wide business processes, using a common database and shared management reporting tools. In fact, the literature has often described ERP systems as a number of

integrated applications, usually consisting of manufacturing, logistics, distribution, accounting, marketing, finance, and human resources [3], [9], [10]. There are a number of challenges that are associated with the implementation of ERP systems and their impact on Supply Chain Logistical Performance.

First ERP systems are not properly educated to the logistics staff, which is necessary to each and every module of Logistics whether it is In-bound Logistics or Out-bound [1]. Second, ERP systems usually effect the whole organization as they have had supply chain implemented in each and every part of the organization as in-plant, towards customer side and suppliers of suppliers [4].

The objective of this paper is to describe the factors, which are critical barriers for successful implementation of ERP systems and how the ERP System implementation relates to the Logistical Performance Management. In order to conduct this research a review of the literature on the subject was conducted. Papers on ERP implementation projects were reviewed by focusing on implementation successes and failures of ERP projects in developing countries.

This concept is quite clear from the literature review that ERP software facilitates the upbringing and growing organization with promising features, if well-implemented and led the organization to a new world of IT-infrastructure which is the first and foremost objective of the organizations in developing countries [5], [14]. Today, many public and private organizations worldwide are implementing ERP systems in place of the functional legacy systems that are not anymore well-compatible with modern business environment [2]. While no two industries' ERP systems are the same, the basic concept of ERP systems is focused on standardization and synchronization of information, and as a result, improved efficiency [6].

Literature Review

Several researchers have developed process models of ERP implementation. In-fact implementing the ERP system is itself a process [7], [8], [18] that begins with planning for the system. When planning is complete, a project team embarks on

and then moves through a number of discrete project phases [9]. There may be a post-implementation review and later a stabilization phase after implementation phase. As several authors [10], [11], [18], [19], [20] have stated, the implementation process of an ERP system is best conceptualized as a business project rather than the installation of a new software technology.

The studies states the factors that rated highest in their described model for implementing ERP system, named 'Innovation Strategy Model' as: collaborative process, communications technology, education and development, intelligence market positioning, and market image campaign. These factors help a lot in extracting prominent features for successfully implementing ERP in developing countries [19].

Evaluating the performance of an ERP system based on the knowledge of ERP implementation objectives, some authors states: "without the ability of assessing the performance of the ERP system, the organizations cannot evaluate its status and monitor its improvement" [21].

Logistical Performance Measures become more necessary to be addressed as the business environment is dramatically changing. So, Companies today face the challenge of increasing competition, expanding markets, and rising customer expectations. This increases the pressure on companies to lower total costs in the entire supply chain, shorten throughput times, drastically reduce inventories, expand product choice, provide more reliable delivery dates and better customer service, improve quality, and efficiently coordinate global demand, supply, and production [3], [6]. The success of ERP systems depends on when it is measured and that success at one point in time may only be loosely related to success at another point in time [11].

Companies must also increasingly share, with their suppliers, distributors, and customers, the critical in-house information they once aggressively protected [2]. Some authors examine the integrated supply chain and the key dimensions of implementation of ERP system within a large manufacturing organization and identifies core issues to confront in successful implementation of enterprise information system, also there study reveals that Information systems such as manufacturing resource planning (MRPII) and enterprise resource planning (ERP) in particular have gained ground in providing support for achieving an integrated supply chain [24]. ERP when successfully implemented, links all areas of a company including order management, manufacturing, human resources, financial systems, and distribution with external suppliers and customers into a tightly integrated system with shared data and visibility [6].

Many companies that attempt to implement ERP systems run into difficulty because the organisation is not ready for integration and the various departments within it have their own agendas and objectives that conflict with each other [6].

Some authors state that the logistics and supply chain environment is characterized by aggressive global competition, rapidly changing technologies and increasingly complex markets, all of which have prompted the development of information systems to facilitate the exchange and update of

relevant data transactions [8]. However, recent reviews on logistics systems indicate that inadequate attention has been given related to the development of a logistics workflow system which can respond rapidly to outside changes in an effective manner [16], [21].

The model on which this research is based is the one that is critically designed for the developing countries keeping in view the CFS's and barriers of successful implementation.

CSF's for ERP Implementation in Developing Countries

V.M. Khaparde (2012) claims that implementing an ERP system is not an inexpensive or risk-free venture [2]. In fact, 65% of executives believe that ERP systems have at least a moderate chance of hurting their businesses because of the potential for implementation problems [3]. It is therefore worthwhile to examine the factors that, to a great extent, determine whether the implementation will be successful. Numerous authors have identified a variety of factors that can be considered to be critical to the success of an ERP implementation in developing countries. The most prominent of these are described below:

1. Excellent project management
2. A great implementation team
3. Data accuracy
4. High User Involvement
5. Extensive education and training
6. Focused performance measures

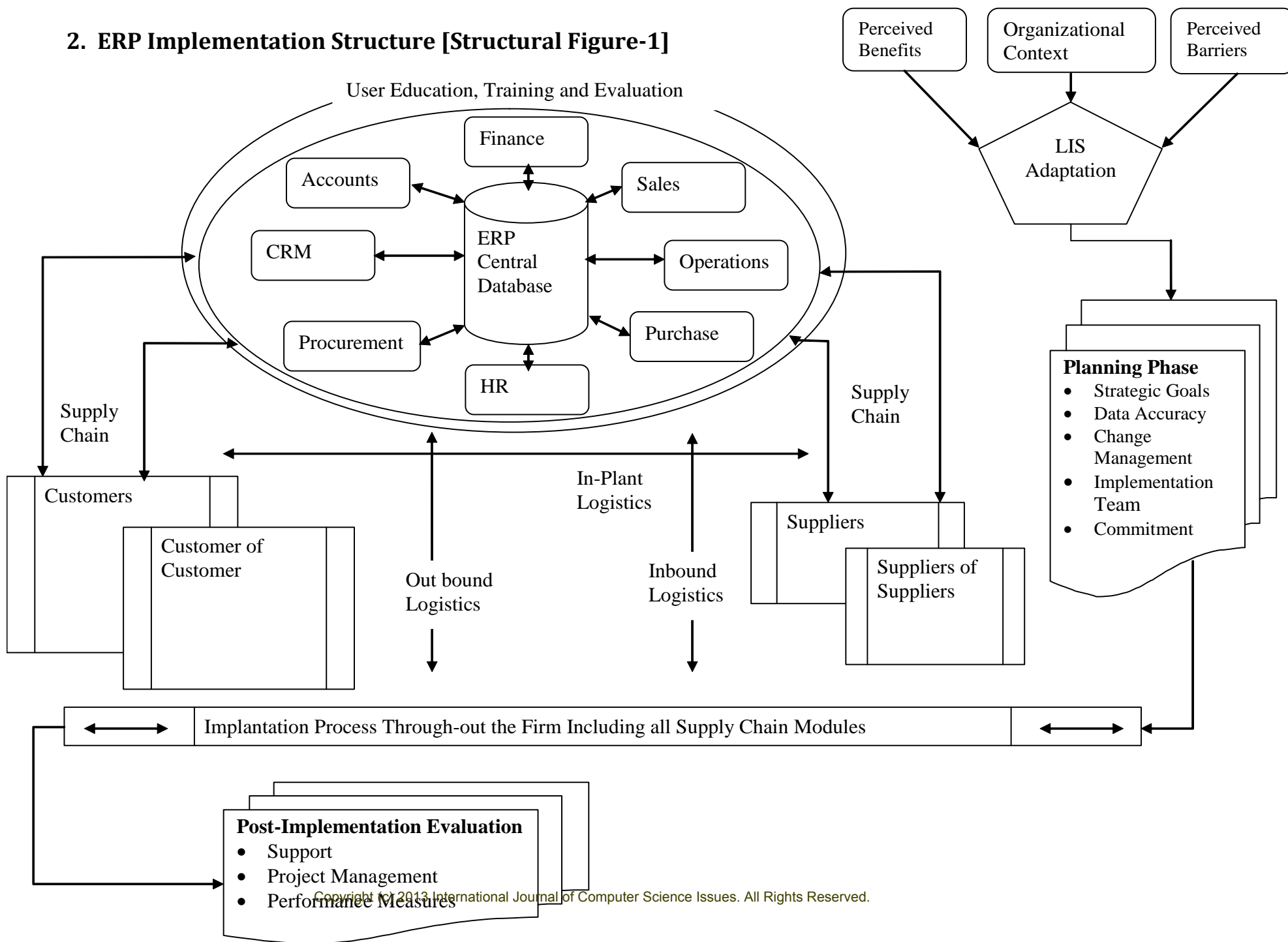
Excellent project management must be the part of ERP systems implementation as it is a set of complex activities to control the implementation process [7]. Project management and control is a function of the project's characteristics such as project size, experiences with the technology, and project structure [9].

A great implementation team means the ERP implementation team should involve of the best people in the organization [13]. Al-Mashari et al., (2006) states that the success of projects is related to the knowledge, skills, abilities, and experiences of the project manager as well as the selection of the right team members [17]. Also, team should not only be technologically competent but also understand the company and its business requirements [12].

Moreover, the team should be familiar with the business functions and products so that they know what needs to be improved to the current system [18].

Data Accuracy means that the Data conversion and integrity must be maintained throughout the system implementation. Much of the success of the implementation process and ultimately the success of the system relies on the ability of the team to ensure data accuracy during the conversion process [11], [14], [15]. This stage of the implementation might also involve the cleaning up of suspect data [19].

2. ERP Implementation Structure [Structural Figure-1]



High User involvement is one of the most cited critical success factors in ERP implementation projects. User involvement increase user satisfaction and acceptance by developing realistic expectations about system capabilities [16]. User involvement is essential because it improves perceived control through participating the whole project plan. According to studies being done there are two areas for user involvement when the company decides to implement an ERP system: user involvement in the stage of definition of the organization's ERP system needs, and user participates in the implementation of ERP systems, both of the user involvement is necessary for successful implementation of ERP system [13].

Extensive educating and training of users to use ERP is important because ERP is not easy to use even with good IT skills authors argued that sufficient training can assist increase success for ERP systems [13], [14]. However, lack of training may lead to failure. According to some authors the main reason for education and training is to increase the expertise and knowledge level of the users within the company [13].

Focused Performance Measures can be ensured by Post-implementation evaluation. Any project is not complete without the allowance for some kind of post-evaluation several authors also suggest that there should be an allowance for a feedback network [8], [9], [15]. The post assessment will be difficult to complete, however, unless there had been established metrics [7] or focused performance measures [11].

If all of the above factors are given the non-trivial importance then they may lead to the successful implementation of ERP, which requires the change in staff behavior, processes, departments and organizations.

Supply Chain Logistical Performance

As a complete ERP System has the modules of logistics and procurement, which are critical to all firms' operations. Customer Relationship Management System (CRM) serves as the front end of the logistics and procurement processes and has to be integrated for optimal performance. The logistics modules govern the customer support processes and procurement processes connect and interact with suppliers. Many firms enter into logistics / procurement information automation without a clear understanding of the potential value and/or not clear path to achieve that value [6] this may be a clear reason of ERP Implementation failure.

Considerable work has been done in development of purchasing procedures and by the time many different tools have been created for routing procedures, e.g. warehouse layout, routing, physical automation tools, and bar coding have come a long way in only a few years of application [11]. Transportation is a highly significant cost area for

most distributors and it's also the main area of Logistics module in an ERP system. Plus it is the main factor to estimate the Logistical Performance Management. Some Authors divide transportation into two areas: private fleets and outsourced transportation [6].

(1)Private fleets are most expensive but usually critical for customer service.

(2)Outsourced transportation can also be subdivided between:

- a) common carrier
- b) third party logistics (3PL) management.

The use of common carriers is frequently an in-house management activity but 3PLs frequently take over the entire transportation (private fleet and common carriers) management process. A study stated that some companies like Dell and Compaq extensively utilize the 3PL and 4PL (planning and controlling of all logistics procedures) service providers which includes DHL, FedEx and UPS [23].

Transportation software solutions were often focused on routing decisions in the past but are now extending to include other cost variables and more complex environments [18].

ERP has related many programs like Ware House Management System (WMS), procurement, inventory classification, and reorder points. The functionality in many of these programs was still not completely adequate in the early 2000's [13]. There also remained issues in connectivity to supplier and customer systems, which hampered the extension to real time of many processes. Evaluating systems has come to depend more and more on their ability to connect to or automate existing processes. Systems will have to be even more flexible.

Key Logistical Performance Measurement

For Logistical Performance Management, to address the Key Performance Indicator (KPI's) is a complex question in itself. Some authors also suggest that there should be an allowance for a feedback network in order to maintain a complete cycle improved and intact [12]. Literature Review of several authors reveals main KPI's for logistics for any firm may be the following:

1. Cycle Time Reduction
2. Material Handling System
3. Time Efficiency
4. Driver Efficiency
5. Order Fulfillment Rate
6. Vehicle blocking Time
7. Vehicle Waiting time

8. Packaging
9. Warehousing Operations
10. Logistics information System as a part of ERP
11. Support of Web Based ERP to Online Logistics Management
12. Vehicle Routing and Scheduling

These KPI's clearly identify the performance measures to be calculated to estimate the Logistical Performance in order to rectify the failures in Logistics.

ERP and Logistics KPI's

Successful ERP Implementation thirst fully needs Logistics KPI's to be fulfilled in the best of their manners. The following portion of this paper further elaborates the importance of KPI's in terms of successful implementation.

Cycle Time Reduction:

Among the other benefits that resource ERP can bring, reduction of cycle time is an important aspect which may lead to an effective logistics department for an organization.

E-resource ERP system has proved that it can produce goods at the flexibility. This means that the customer will get individual attention and features that they want without spending more money or waiting for long periods, (A. Gunasekaran, E.W.T. Nagai, 2005).

Material Handling System:

Material Handling system include the following systems to be efficient for the successful implementation of ERP

Time Efficiency: Logistics is totally based upon the time management and ERP system helps in increasing the time efficiency by maintaining the Loaded time while traveling and traveling with the empty vehicles and provides an efficient plan so that there may be the shortest empty traveling time.

$$VT = TL / TE$$

Where VT is Vehicle Travelling time, TL is Total Loaded Travel Time and TE is Total Empty Travel Time. Hence for the improvement in logistics and successful running of ERP system time efficiency is necessary to be ensured.

Order Fulfillment Rate:

The effectiveness of Logistics Module is increased by the salient feature of ERP by maintaining the Order Fulfillment Rate. It can be maintained by having the complete record of The Number of Load Completed over a

period of time, which helps in increasing the order fulfillment rate.

Vehicle blocking Time:

Keeping track of Vehicle Blocking Time definitely helps in improving logistics for any organization. ERP systems provides the functionality to maintain efficiently the time where vehicle are unable to move due to traffic or because of other reasons. If this time can be reduced then the shipment and logistics whether is inbound or outbound will definitely get its worth.

Vehicle waiting time:

Another impact of time is Vehicle Waiting Time When Lifter is waiting for drive or to be unloaded. This time also is hindrance for efficient shipment specifically in in-plant logistics. Automated system provided by ERP also help in keeping track of Vehicle waiting time in order to increase the money value of time.

Packaging:

Efficient packaging includes wrapping a product in a sort of package that satisfies first of all safety & protection, then handling ergonomics, indication of the information about the product and its physical appearance i.e. how does it look like.

So for safe and efficient shipment packaging is also very important to be keep in view with non-trivial importance. Most of the ERP systems provide the simulations for the packaging.

Warehousing Operations

Warehousing is an Inbound processes which may include different sub-functions.

- Receiving (~10% of warehouse operating costs):
- Put-away (~15% of warehouse operating costs):
- Storage
- Processing customer orders
- Order-picking (~55% of warehouse operating costs):
- Checking orders for completeness

An ERP System including all the warehousing sub-functions in Logistics Module helps in elegant warehousing resulting in increase in order fulfillment.

Logistics information System as a part of ERP

Logistics information system: Convert data into information, is a part of an effective ERP system. It stores all the information the people, equipment, and procedures to gather, sort, analyze, evaluate, and distribute accurate information to logistics decision makers. The Studies state that the growth of the supply chain concept has required

logistics organizations to improve the flow of information both internally and externally [13]. The increased information requirements have facilitated an integration of logistics information systems (LIS) and supply chain information systems in many companies. While having the ERP System the organization does not need to implement a separate Logistics Information System because sub-system of ERP in Logistics Module provide all the functionalities in plus.

The survey conducted by [19] revealed the fact that almost 73% of the companies were using some portion of an ERP system. Furthermore, 20% were in the process of implementing and only 7% had no plan or were unsure. Therefore, the data supports the concept that ERP is becoming a widely accepted computerized process for handling data in American corporations with over 92% of companies using or in the process of implementing. So more advanced logistics firms, those that have successfully implemented the integrated logistics concept, are more likely to have implemented the logistics planning, production scheduling, financial management and demand forecasting components of an ERP. This literature study leads to the pre-implementation phase of ERP as mentioned in the conceptual framework described in structural-figure-1

Support of Web Based ERP to Online Logistics Management

Approximately 25% of the world's population uses the internet – up from 5% at the beginning of the 21st century
3 Specific Influences on Logistics Include:

- Online Retailing
- On-Demand Software
- Electronic Procurement

If the organization has implemented a Web Based ERP system then it will definitely be having benefits of Online Retailing, On-Demand E-resources and E-procurement. With web enabled E-resource ERP system, customers can place the order, track the status of the order and make the payment sitting at home.

Vehicle Routing and Scheduling

Vehicle Routing and Scheduling are the important factors in Logistics. An ERP System, keenly handle the issues of Routing and Scheduling. Vehicle Routing- Determining the sequence of delivery locations to be visited by a vehicle / driver. Vehicle Schedule-Determining, the time sequence of time-dependent demand delivery locations to be visited by a vehicle / driver.

A study address the design of a real-time logistics information system (RLIS) for trucking industry was addressed, considering the effects of traffic congestion during rush hour. Two types of forecasting methods, time

series models and nonlinear fuzzy reasoning, were created and embedded into the RLIS [25]. The results from practical web services reveal a substantial improvement of the truck scheduling performance and help decision makers determine schedule coordination between ground transportation and aircraft departures at airport cargo terminals.

Conclusion

This paper has reported on the CSF's in implementing ERP system and its impact on Supply chain logistical performance especially in developing countries. The results show that the criteria which are common in internal factors and external factors in an enterprise cannot be overlooked while implementing ERP system. The reasons for occurring the barriers while implementing ERP are because of ignorance about the critical success factors which are cited above. Thus conclusion is drawn that the barriers of ERP while implementation can be avoided in developing countries if and only if proper attention is taken and non-trivial importance is given to CFS's discussed in this study. Implementation of ERP is rigorous and costly process and it can be done at ease if CSF's are in view and the barriers are mitigated properly.

For researchers, this paper provides useful model of ERP system implementation and provides a foundation for further empirical research in frameworks for implementation in developing countries to overcome the barrier. For practitioners, it provides a template which suggests important CSFs to consider during particular project phases. The study emphasize that practitioners need to pay even more attention to the planning phase and to the manifestation of CSFs across the phases of the implementation project. It also provides a picture-as-whole for a successful project implementation. More critical factors can be addressed in the implementation framework for more reliable results.

References

- [1] Dr. Bernard Wong, David Tein, (2009) Critical Success Factors for ERP Projects, Information Systems Management, Vol. 16, no. 3, Summer, pp. 7-14.
- [2] Vijay M. Khaparde, (2012) Barriers of ERP while implementing ERP: a Literature Review, IOSR Journal of Mechanical and Civil Engineering (IOSR-JMCE) ISSN: 2278-1684 Volume 3, PP 49-91
- [3] S. Shankarnarayanan, (2000), ERP systems—using IT to gain a competitive advantage.
- [4] C. Loizos, (2008) ERP: Is it the ultimate software solution, Industry Week 733.

- [5] C. Dillon, (2000), Stretching toward enterprise flexibility with ERP, APICS—The Performance Advantage 38–43.
- [6] P.H. Ketikidisa, S.C.L. Koh, (2008) The use of information systems for logistics and supply chain management in South East Europe: Current status and future direction, Omega, Volume 36, Issue 4, Pages 592–599
- [7] Stephen M. Rutner, Brian J. Gibson, Susan R. Williams, (2003) The impacts of the integrated logistics systems on electronic commerce and enterprise resource planning systems, Transportation Research Part E: Logistics and Transportation Review Volume 39, Issue 2, Pages 83–93
- [8] Raymond F. Boykin, (2008), The integration of ERP into a logistics curriculum: applying a systems approach, Journal of Enterprise Information Management, ISSN: 1741-0398
- [9] T. Davenport, (1998) Putting the enterprise into the enterprise system, Harvard Business Review 76 (4)121–132
- [10] S. Langdoc,(1998), ERP reality check for scared CIOs, PC Week 15 (38)88.
- [11] G. Langenwaller,(2000) Enterprise Resources Planning and Beyond Integrating Your Entire Organization, St. Lucie Press, Boca Raton, FL,.
- [12] C. Ptak, E. Schragenheim, (2000) ERP: Tools, Techniques, and Applications for Integrating the Supply Chain, St. Lucie Press, Boca Raton, FL.
- [13] G. Langenwaller, (2000) Enterprise Resources Planning and Beyond: Integrating Your Entire Organization, St. Lucie Press, Boca Raton, FL.
- [14] D. McCaskey, M. Okrent, (1999), Catching the ERP second wave, APICS—The Performance Advantage (December) 34–38.
- [15] T. Minahan, (1998), Enterprise resource planning, Purchasing 16 112–117.
- [16] H. Oden, G. Langenwaller, R. Lucier, (1993) Handbook of Material and Capacity Requirements Planning, McGraw-Hill, New York.
- [17] O. Volkoff, B. Sterling, P. Nelson, (1999) Getting your money's worth from an enterprise system, Ivey Business Journal (1) 54–57.
- [18] Anne Parr, Graeme Shanks (2000), A model of ERP project implementation, Journal of Information Technology 15, 289–303
- [19] Keng Siau, Jake Messersmith (2013), Analyzing ERP Implementation at a Public University Using the Innovation Strategy Model, International Journal of Human-Computer Interaction, 16(1), 57–80
- [20] M. Lynne Markus, Sheryl Axline (2000), Learning from adopters' experiences with ERP: problems encountered and success achieved, Journal of Information Technology, 15, 245–265
- [21] Goutsos, S., & Karacapilidis, N. (2004). Enhanced supply chain management for ebusiness transactions. International Journal of Production Economics, 89(2), 141–152.
- [22] Liu, J. X., Zhang, S. S., & Hu, J. M. (2005). A case study of an inter-enterprise workflow-supported supply chain management system. Information & Management, 42(3), 441–454.
- [23] C.K.M. Lee, William Ho, G.T.S Ho, H.C.W Lau, (2011) Design and development of logistics workflow systems with demand management with RFID, Expert Systems with Applications 38 (2011), 5428-5437
- [24] Yahaya Yusuf,, A. Gunasekaran, Mark S. Abthorpe (2004), Enterprise information systems project implementation: A case study of ERP in Rolls-Royce, Int. J. Production Economics 87 (2004) 251–266
- [25] Shih-Che Loa, Randolph W. Hall (2008), The design of real-time logistics information system for trucking industry, Computers & Operations Research 35 (2008) 3439 – 3451

First Author

Fareed ud din, confronting Masters of Sciences in Computer Science after securing Honors Degree in Bachelors of Sciences in Computer Science on fully funded degree scholarship provided by the Ministry of IT Pakistan under the R&D fund, do have the 6 International publications eagerly indulged in the field of research and technology for contemporary progress in Pakistan and technological solutions to the world issues. Currently serving Superior University, Lahore Pakistan, for mentoring students in field of technology.

Second Author

Saroop Anwer, a Ph.D scholar, secured his Master Degree in Business Administration. Do have the International Research Exposure in the field of Supply Chain and Logistics. Currently offering his services to Superior University, Lahore, Pakistan.