

Identification of Factors and Indicators for Success Measurement of ERP System

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Abstract. The ERP system applications are applied to several functional areas such as finance, logistics, human resources, etc to improve the quality and service in an organization. As long as diversity and complexity of such ERP applications are increasing in an organization there is a need of ERP system success measurement. ERP system success factors and success indicators are ambiguous in available literatures. Most of the authors have mixed success factors with success indicators and vice versa. There is no any separating line between two terms. This study draws a line between various ERP system success factors and success indicators. First part of the study demonstrates various success factors of ERP system and second part demonstrates various success indicators of ERP System. This separating line might be used to develop an ERP system success measurement model. Further in this research article authors have presented a conceptual model integrating success factors and success indicators. Findings presented are based on literatures related to ERP system success.

Keywords: Success Factors, Success Indicators, ERP system, ERP System Success Measurement.

1. Introduction.

The business environment is changing dramatically and in order to stay competitive in the market, organizations must improve their business practices and procedures. Organizations within all departments and functions upgrade their capability to generate and communicate accurate and timely information [1]. SearchCIO.com (2007) defines Enterprise Resource Planning (ERP) as “an industry term for the broad set of activities supported by multi-module application software that helps a manufacturer or other business manage the important parts of its business, including product planning, parts purchasing, maintaining inventories, interacting with suppliers, providing customer service, and tracking orders. ERP can also include application modules for the finance and human resources aspects of a business. Typically, an ERP system uses or is integrated with a relational database system. The deployment of an ERP system can involve considerable business process analysis, employee retraining, and new work procedures”[2] The basic purpose of enterprise resource planning (ERP) system is to streamline and integrate operation processes and information flows within the organization, ensuring optimal utilization of the available resources. Business environments are changing and remaining competitive appears to be a challenge for companies. Organizations must improve their business practices, procedures and their qualities in all aspects because of the influence of the competitive market on the importance and impact of information systems [1-3]. ERP system supports a process-oriented view of the company and provides standardized business processes and real-time financial and production information for the quality management [3].

2. Research Approach

The purpose of this research is to identify success factors and success indicators to present a conceptual model to measure the ERP system success in an organization. The main steps for the research study are:

- Literature review related to success factors in ERP system

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- Literature review related to success indicators in ERP system
- To develop a conceptual model integrating success factors and success indicators.

3. Review of Literature

For this research, literature review is divided into two categories. First category of literature review covers ERP success factors and second covers the literatures related to ERP success indicators.

3.1. Literature related to ERP System Success Factors

Bullen and Rockart (1986) defined success factors as “the limited number of areas in which satisfactory results will ensure successful competitive performance for individual, department, or organization”. Most of the ERP implementation projects witnessed failure at the end because of not keeping in due consideration factors that are vital to the success both prior and during different implementation phases [5]. For the current study, six success factors and forty one sub factors are identified after a comprehensive and thorough review of literature. A consolidated list of these factors that are mostly cited in literatures is illustrated in Table 1.

Table-1. Factors Affecting ERP System Success

Factors	Sub Factors
1. Organizational Factors	Top Management Support Commitment [1,2,3,5]
	Project team selection & competence [2,5,7]
	BPR [3,5]
	Effective Project Management [3,5,7]
	Formalised project plan/schedule [5]
	Interdepartmental communication [5]
	Interdepartmental co operation [5]
	Use of steering committee [5]
	Management of expectations [8]
	Clear goals and objectives [1,5,8]
	Size of organization [Annual Turnover, workforce]
	Organizational Culture [8]
	Organizational Structure[8]
	Reporting Capability
Subjective Norm [1]	
2. Process Factors	Alignment[2]
	Documentation[2]
	Integration[2]
	Process redesign[2]
3. Technology Factors	Hardware & Software [2]
	Systems management[2]
	Minimal Customization [1]
	System Environment [1]
4. Data Factors	Software Selection[1]
	Compatibility [1]
	Result Demonstrability [1]
	Maintenance and integrity[2]
5. People Factors	Data analysis and conversion
	Job Relevance[1]
	Image[1]
	Training & Education[1,2,3,5,7]
	Skills development[2]
	Knowledge management[2]
	User Involvement [3]
	Change management [3]
ERP staff competence [3]	
6. Vendors/ Consultant Factors	User/management attitudes [3]
	Vendor–customer partnership [8]
	Vendor support [8]
	Consultant Support [1,8]
	Selection of Qualified Consultants [8]

3.2. Literature related to ERP System Success Indicators

Sometimes success is defined in terms of making progress toward strategic goals, but often success is simply the repeated, periodic achievement of some level of operational goal (e.g. zero defects, 10/10 customer satisfaction, etc.)[21]. As per literature survey, various authors have specified different dimensions and sub- dimensions to measure ERP system success. A consolidated list of these dimensions and sub-dimensions that are mostly cited in literatures is illustrated in Table 2.

Table-2. Dimensions and Sub-dimensions to measure ERP success

Dimensions	Sub-dimensions	Author[Year]
1. System quality	1.Accuracy,	Ifinedo P. [2011, 2007, 2006],Ch. Seetha Ram [2010], Tsai W.H. [2008], Gable et.al.[2003]
	2.flexibility,	Ifinedo P. [2011, 2007, 2006],Chien Shih-Wen et.al.[2007], De Lone W. & McLean E. [2003],
	3.Ease of use,	Ifinedo P. [2011, 2007, 2006],Wei K.S.[2009], Ifinedo P.[2007], De Lone W. & McLean E. [2003],
	4.Ease of learn,	Ifinedo P. [2011, 2007, 2006], Gable et.al,[2003]
	5.Reliability,	Ifinedo P. [2011, 2007, 2006],Chien Shih-Wen et.al.[2007], De Lone W. & McLean E. [2003],
	6. Allows Data integration,	Ifinedo P. [2011, 2007, 2006],Chien Shih-Wen et.al.[2007], De Lone W. & McLean E. [2003]
	7.Efficiency,	Ifinedo P. [2011, 2007, 2006], Gable et.al,[2003]
	8.Customization,	Ifinedo P. [2011, 2007, 2006], Gable et.al,[2003]
	9.Has good features,	Ifinedo P. [2011, 2007, 2006],
	10.Integration with other IT systems,	Ifinedo P. [2011, 2007, 2006], Ifinedo P.[2007], Gable et.al.[2003]
	11.Meets users requirements,	Ifinedo P. [2011], Gable et.al,[2003]
	12. Provide up-to-date information,	Ch. Seetha Ram [2010], Tsai W.H. [2008]
	13.Timeliness,	Ch. Seetha Ram [2010]
	14.Portability,	Wei K.S.[2009], Ifinedo P.[2007], De Lone W. &
	15.Productivity,	Wei K.S.[2009],
	16.Data content,	Tsai W.H. [2008], Gable et.al,[2003]
	17.Data up to dated,	Tsai W.H. [2008], Gable et.al,[2003]
	18.Functionality	Chien Shih-Wen et.al.[2007], Ifinedo P.[2007],
	19.Data quality,	Chien Shih-Wen et.al.[2007], De Lone W. & McLean
	20.Importance,	Ifinedo P.[2007], De Lone W. & McLean E. [2003]
	21.Functionality,	De Lone W. & McLean E. [2003]
	22.Access,	Gable et.al,[2003]
	23.System features,	Gable et.al,[2003]
	24.Sofistication,	Gable et.al,[2003]
2. Information quality	1.Timeliness,	Ifinedo P. [2011, 2007, 2006],Chien Shih-Wen et al [2007], De Lone W. & McLean E. [2003]
	2.Understandable,	Ifinedo P. [2011, 2007, 2006], Gable et.al,[2003], Lee
	3.Important,	Ifinedo P. [2011, 2007, 2006], Gable et.al,[2003]
	4.Brief/ concise,	Ifinedo P. [2011, 2007, 2006],Wei K.S.[2009], Gable
	5.Relevance,	Ifinedo P. [2011, 2007, 2006],Chien Shih-Wen et.al.[2007], De Lone W. & McLean E. [2003],
	6.Usability	Ifinedo P. [2011, 2007, 2006],Wei K.S.[2009], Gable
	7.Available,	Ifinedo P. [2011, 2007, 2006],Wei K.S.[2009], Gable
	8.Accuracy,	Ifinedo P. [2011], Ch. Seetha Ram [2010], Chien Shih-
	9.Preciseness,	Ch. Seetha Ram [2010],
	10.Sufficiency,	Ch. Seetha Ram [2010], Chien Shih-Wen et.al.[2007],
	11.ComprehenSible,	Wei K.S.[2009],
	12.In a correct format,	Wei K.S.[2009], Gable et.al,[2003]
	13.Consistency ,	Chien Shih-Wen et.al.[2007], De Lone W. & McLean
	14.Up-to-date,	Ifinedo P.[2007],
	15.Completteness,	De Lone W. & McLean E. [2003], Gable et.al,[2003],
	16.Content,	Gable et.al,[2003]
	17.Uniqueness,	Gable et.al,[2003]
	18.Infiemative,	Gable et.al,[2003]
	19.Reliability,	Gable et.al,[2003], Lee Yang W.[2002]
	20.Cliarity,	Gable et.al,[2003]
	21.Appearance,	Gable et.al,[2003]
	22.Accessibility,	Lee Yang W.[2002]

	23. Ease of operation,	Lee Yang W.[2002]
	24.Free-of-error,	Lee Yang W.[2002]
	25.Interpretability,	Lee Yang W.[2002]
	26.Objectivity,	Lee Yang W.[2002]
	27.Reputation,	Lee Yang W.[2002]
	28.Security,	Lee Yang W.[2002]
3. Servive Quality	1.Tangibles,	Rahaman A. et.al.[2011], Wei K.S.[2009], De Lone W. & McLean E. [2003]
	2.Reliability,	Rahaman A. et.al.[2011], Ch. Seetha Ram [2010], Wei K.S.[2009], De Lone W. & McLean E. [2003]Chien Shih-Wen et.al.[2007]
	3.Responsiveness,	Rahaman A. et.al.[2011], Ch. Seetha Ram [2010], Wei K.S.[2009], Chien Shih-Wen et.al.[2007], De Lone W. & McLean E. [2003]
	4.Assurance,	Rahaman A. et.al.[2011], Ch. Seetha Ram [2010], Wei K.S.[2009], Chien Shih-Wen et.al.[2007], De Lone W. & McLean E. [2003]
	5.Empathy,	Rahaman A. et.al.[2011], Wei K.S.[2009], De Lone W. & McLean E. [2003]
	6.Service level,	Chien Shih-Wen et.al.[2007]
4. Individual impact	1.Enhanced Creativity,	Ifinedo P. [2011, 2007, 2006],
	2. Enhanced Learning ,	Ifinedo P. [2011, 2007, 2006], Gable et.al,[2003]
	3.Improved individual productivity,	Ifinedo P. [2011, 2007, 2006],
	4.Beneficial for individual's tasks,	Ifinedo P. [2011, 2007, 2006],
	5. Individual Decision Quality,	Ifinedo P. [2011, 2007, 2006],Tsai W.H. [2008], Gable et.al,[2003]
	6.Saves time for Individual tasks/duties,	Ifinedo P. [2011, 2007, 2006], Gable et.al,[2003]
	7. Individual Performance,	Tsai W.H. [2008],
	8. Individual Productivity,	Tsai W.H. [2008], Gable et.al,[2003]
	9.Problem Identification,	Tsai W.H. [2008], Gable et.al,[2003]
	10.Accurate Interpretation,	Tsai W.H. [2008], Gable et.al,[2003]
	11. Attitude towards usage,	Chien Shih-Wen et.al.[2007]
	12.Perceived usefulness.	Chien Shih-Wen et.al.[2007]
	13.Awareness,	Gable et.al,[2003]
5. System Use	1.Frequency of use,	De Lone W. & McLean E. [2003]
	2.Time of use,	De Lone W. & McLean E. [2003]
	3.No. of accesses	De Lone W. & McLean E. [2003]
	4.Usage pattern,	De Lone W. & McLean E. [2003]
	5.Dependency,	De Lone W. & McLean E. [2003]
6. Workgroup impact	1.Helps to improve workers' participation,	Ifinedo P. [2011, 2007, 2006],
	2.Improves organizational-wide communication,	Ifinedo P. [2011, 2007, 2006],
	3.Improves inter-departmental coordination,	Ifinedo P. [2011, 2007, 2006],
	4.Create sense of responsibility,	Ifinedo P. [2011, 2007, 2006],
	5.Improves the efficiency of sub-units ,	Ifinedo P. [2011, 2007, 2006],
	6.Improves work-groups productivity,	Ifinedo P. [2011, 2007, 2006],
	7.Enhances solution effectiveness,	Ifinedo P. [2011, 2007, 2006],
7. Organizational impact	1.Reduces organizational costs,	Ifinedo P. [2011, 2007, 2006], Gable et.al,[2003]
	2.Improves overall roductivity,	Ifinedo P. [2011, 2007, 2006], Gable et.al,[2003]
	3.Enables e-business/e-commerce,	Ifinedo P. [2011, 2007, 2006], Gable et.al,[2003]
	4. Provides us with competitive advantage,	Ifinedo P. [2011, 2007, 2006],
	5.Increases customer service/ satisfaction,	Ifinedo P. [2011, 2007, 2006],
	6.Facilitates business process change,	Ifinedo P. [2011, 2007, 2006],
	7.Supports decision making,	Ifinedo P. [2011, 2007, 2006],
	8.Allows for better use of organizational data resource,	Ifinedo P. [2011, 2007, 2006],
	9.Financial Perspective,	Tsai W.H. [2008],
	10.Customers Perspective,	Tsai W.H. [2008],
	11.Internal Business Process Perspective,	Tsai W.H. [2008], Gable et.al,[2003]
	12.Learning & Growth Perspective,	Tsai W.H. [2008],
	13.Staff requirement,	Gable et.al,[2003]
	14.Cost reduction,	Gable et.al,[2003]

8. Benefit of use	1.Establish good relationships with the user community,	Ch. Seetha Ram [2010],
	2.Satisfy end-user requirements,	Ch. Seetha Ram [2010],
	3.Exploit IT opportunities	Ch. Seetha Ram [2010],
9. User satisfaction	1.ERP Project satisfaction,	Ch. Seetha Ram [2010], Tsai W.H. [2008], Chien Shih-Wen et.al.[2007]
	2.Information satisfaction,	Ch. Seetha Ram [2010], Tsai W.H. [2008], Chien Shih-Wen et.al.[2007], Gable et,al,[2003]
	3.User satisfaction,	Ch. Seetha Ram [2010], Chien Shih-Wen
	4.Software Satisfaction,	Tsai W.H. [2008], Gable et,al,[2003]
	5.Software interface Satisfaction,	Tsai W.H. [2008],
	6.Overall system Satisfaction,	Tsai W.H. [2008], Gable et,al,[2003]
	7.Enjoyment,	Gable et,al,[2003]
10. Net value	1.Enhance competitiveness,	Ch. Seetha Ram [2010], Chien Shih-Wen et.al.[2007]
	2.Responsiveness,	Ch. Seetha Ram [2010],
	3. more quickly response to change,	Chien Shih-Wen et.al.[2007]
	4.services to third parties,	Chien Shih-Wen et.al.[2007]
	5.Ensure that ERP projects provide business,	Chien Shih-Wen et.al.[2007]
	6.Establish and maintain a good image and reputation with management,	Chien Shih-Wen et.al.[2007]
11. Net Benefits	1.Internal integration,	Chien Shih-Wen et.al.[2007]
	2.Improved information,	Chien Shih-Wen et.al.[2007]
	3. Improved processes,	Chien Shih-Wen et.al.[2007]
	4.Improved customer service,	Chien Shih-Wen et.al.[2007]
	5. Tangible benefits,	Chien Shih-Wen et.al.[2007]
	6.Competitive advantage,	De Lone W. & McLean E. [2003]
	7.Alignment,	De Lone W. & McLean E. [2003]
	8.Customer relations benefits,	De Lone W. & McLean E. [2003]
	9.Information access,	De Lone W. & McLean E. [2003]
	10.Information quality,	De Lone W. & McLean E. [2003]
	11.Information flexibility,	De Lone W. & McLean E. [2003]
	12.Communication efficiency,	De Lone W. & McLean E. [2003]
12. Vendor / Consultant Quality	1.Provides adequate technical support,	Ifinedo P. [2006],
	2.Credible and trustworthy,	Ifinedo P. [2006],
	3.Has good relationships with my organization,	Ifinedo P. [2006],
	4.Experienced and provides quality training and services,	Ifinedo P. [2006],
	5.Communicates well with my organization	Ifinedo P. [2006],
13. System Success Measure	1.Overall impact is positive,	Ifinedo P. [2006],
	2.Overall impact on my organization is positive	Ifinedo P. [2006],

4. Conceptual Model Integrating Success Factors and Success Indicators

One of the objectives of this paper is to develop a conceptual model to measure ERP system success. On the basis of literature review, two columns might be geared up, one for factors affecting ERP system success and second for success indicators in an organization. Fig-1 illustrates a conceptual model integrating success factors and success indicators to measure the success of ERP.

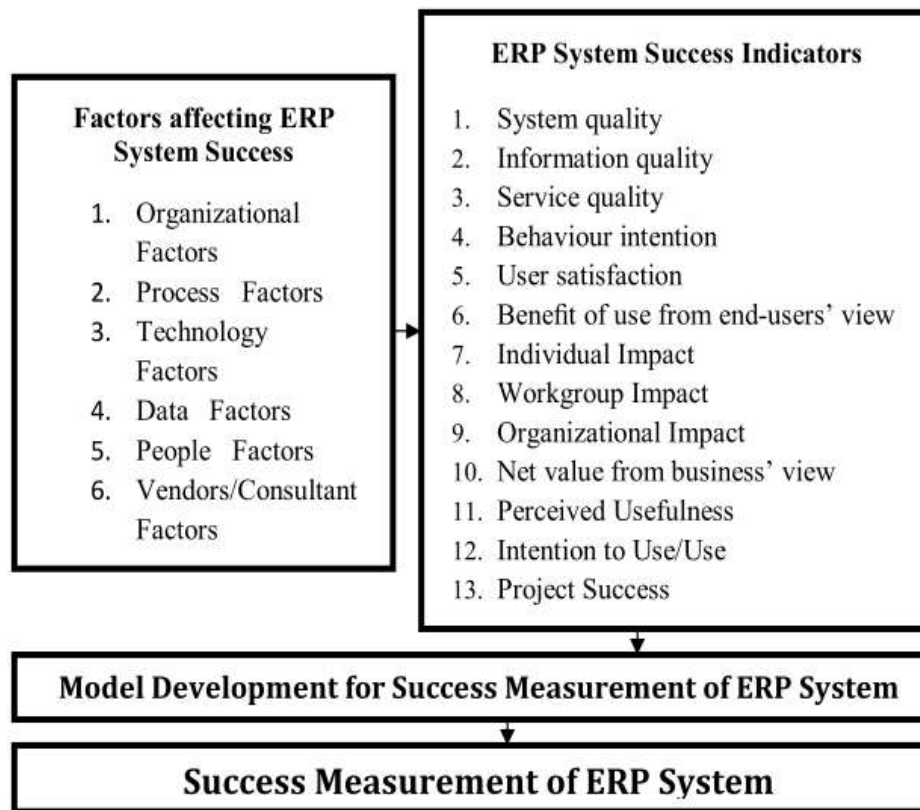


Fig-1: A Conceptual Model Integrating Success Factors and Success Indicators

5. Conclusion

One major reason for doing measurement of ERP system success is to take actions based on the results of the measurement to generate change, betterment and quality. This is actually an important fact due to the expensive failure of such advanced systems. This paper, first, enlists the success factors and sub factors which directly influences the ERP system success indicators. This paper presents a streamlined list of ERP success factors and sub factors since these factors are in diverse form in available literatures. Second, this paper enlists the success Indicators and sub indicators which measure the success of ERP system in an organization. The contributions of this paper are the separation of success factors and success indicators associated with the ERP system success measurement. Eventually authors have projected a conceptual model integrating ERP system success factors and success indicators. This conceptual model will help the organizations to make quality ERP system measurement instruments and tools. However correlations among success factors and success indicators have to be established using some suitable tool in present conceptual model.

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