



# CRITICAL SUCCESS FACTORS IN ERP SYSTEM IMPLEMENTATION: RESULTS FROM AN EXPLORATORY STUDY

**T. Ramayah**

School of Management, Unviersiti Sains Malaysia, Penang, Malaysia.  
[ramayah@usm.my](mailto:ramayah@usm.my)

**A. Sawaridass**

School of Management, Unviersiti Sains Malaysia, Penang, Malaysia.  
[sawaridass.arokiasamy@intel.com](mailto:sawaridass.arokiasamy@intel.com)

**Yulihhasri**

Faculty of Economics  
 Andalas University Indonesia, Padang, Indonesia  
[yulihhasri\\_eri@yahoo.com](mailto:yulihhasri_eri@yahoo.com)

## ABSTRACT

This paper reports the findings from an exploratory study conducted prior to a formal study into the critical success factors that can play a role during the implementation process in Malaysian organizations. A survey was carried out to identify top 10 critical success factors from a list of 27 critical success factors compiled from past research. Information Technology directors from 10 different manufacturing organizations in Penang, Malaysia rated the list and top 10 critical success factors were identified for further research. The top ten critical success factors identified are Top management support, Business Plan & Vision, Teamwork & Composition, Project management, Project champion, Learning competency, User training and education, Change readiness, Vendor support and Communication. The Friedman test was significant ( $\chi^2 = 135.35, p < 0.01$ ) indicating that the managers ranked the 27 critical factors differently with some ranked much more important as compared to the others. A further test of concordance was carried out and the results also show that there is an agreement among the ratings among the 10 managers where the Kendall's W test was significant ( $\chi^2 = 135.35, p < 0.01$ ) with a coefficient of 0.621 (a value closer to 1 indicates total agreement). Thus we can conclude that the 10 most important critical success factors identified are common factors that the ten managers mutually agreed upon. Thus the next step will be for a formal study to be carried out developing a proper instrument to measure the 10 critical success factors identified.

## KEYWORD

Critical Success Factors [CSF]

Exploratory

Manufacturing organizations

Malaysia Internet

Concordance

Business

**Preface**

The business environment has become increasingly complex and the marketplace has changed from local to global. Constant pressure is applied on the management to improve competitiveness by lowering operating cost and improving logistics. Organizations therefore have to continuously re-adjust or realign their operations to meet all these challenges by being responsive to the customer and competition. A useful tool that businesses are turning to in order to build strong capabilities, improve performance, undertake better decision-making and achieve a competitive advantage is Enterprise Resource Planning [Mudimigh, & Al-Mashari<sup>i</sup>, 2001]. Enterprise Resource Planning (ERP) system is a packaged business software system that enables a company to manage the efficient and effective use of resources (materials, human resources, finance, etc) by providing a total integrated solution for the organization's information processing needs [Nah et al.<sup>ii</sup>, 2001]. ERP as a business solution aims to help the management by setting better business practices and equipping them with the right information to take timely decision. The Star, Jan 15th 2002 [The Star<sup>iii</sup>, 2002] reported that ERP has become the pre-requisite for companies to compete in global economies, especially in the e-commerce era. Based on a survey by AMR Research, ERP application is expected to grow by 32% over the next 5 years and total market value will reach USD66.6 billions by 2003 which represents 43% of the application budget of the organizations [AMR Research<sup>iv</sup>, 1999]. In May 2001, Boston-based AMR Research predicted that total ERP Company's revenue will grow at a 14 % compounded annual growth rate, increasing to USD36 billion in 2005 from USD 21 billion in 2001.

Many researchers prior to this have done research on the critical success factors and out of these there has been a long list of critical success factors identified [Nah et al.<sup>ii</sup>, 2001; Somers, & Nelson<sup>v</sup>, 2001; Nah et al.<sup>vi</sup>, 2003; Esteves, & Pastor<sup>vii</sup>, 2000; Akkermans, & Helden<sup>viii</sup>, 2002; Zhang et al.<sup>ix</sup>, 2002; Holland et al.<sup>x</sup>, 1998]. Nevertheless, the use of that many factors would prove cumbersome and not parsimonious. As such an endeavor was undertaken to first embark on an exploratory study to identify a smaller list of critical success factors that are applicable in the context of Malaysia before a formal

research is carried out. This paper reports the findings from that exploratory study.

**CRITICAL SUCCESS FACTORS**

Previous research [Somers, & Nelson<sup>v</sup>, 2001], views critical success factors as situated exemplars that help extend the boundaries of process improvement, and whose effect is much richer if viewed within the context of their importance in each stage of the implementation process. Table 1 summarizes the CSF's and the studies. From this table, factors such as top management support, and project management seems to be a broad consensus among these researchers.

A list of 27 CSF's were compiled from the past research done by some authors [Mudimigh, & Al-Mashari<sup>i</sup>, 2001; Nah et al.<sup>ii</sup>, 2001; Somers, & Nelson<sup>v</sup>, 2001; Nah et al.<sup>vi</sup>, 2003; Esteves, & Pastor<sup>vii</sup>, 2000; Akkermans, & Helden<sup>viii</sup>, 2002; Zhang et al.<sup>ix</sup>, 2002; Holland et al.<sup>x</sup>, 1998; Somers et al.<sup>xi</sup>, 2000; Markus, & Tanis<sup>xii</sup>, 2000; Jafari et al.<sup>xiii</sup>, 2006; Stratman, & Roth<sup>xiv</sup>, 2002]

**Table 1: Critical Success Factors Mentioned in the Literature**

	Critical Success Factors (CSF's)	a	b	c	d	e	f	g	h	i	j
1	Appropriate business and IT legacy systems				X	X			X	X	X
2	Architecture choices	X			X	X			X		
3	Business Plan & Vision		X	X	X	X			X	X	
4	Business Process Reengineering	X	X		X	X		X	X		X
5	Careful package selection	X				X	X	X			
6	Change readiness & Culture	X	X	X	X	X		X	X		X
7	Clear Goals & Objective	X				X	X				
8	Communication	X		X	X	X	X		X	X	X
9	Data analysis & conversion	X						X			X

10	Education on new business processes	X				X					X
11	Empowered decision makers					X					
12	Learning competency	X	X								
13	Management of expectations	X					X				
14	Minimal customization	X				X					
15	Monitoring and evaluation of performance				X					X	
16	Organizational Trust between partners					X	X				
17	Partnership with vendor	X									
18	Project champion	X			X	X	X		X		
19	Project management	X	X	X	X	X	X	X	X	X	X
20	Strategic IT Planning		X			X					X
21	Teamwork & Composition	X	X		X	X	X	X			X
22	Top management support	X	X	X	X	X	X	X	X	X	X
23	Use of consultants	X				X					
24	Use of steering committee	X									
25	Use of vendors' tools	X									
26	User training and education	X	X	X		X		X			X
27	Vendor support	X					X	X		X	X

Light & Gibson, (1999) ; j: Jafari, S.M, Osman, R.M, Yusuff R.M & Tang S.H. (2006).

**METHODOLOGY**

Information Technology directors from 10 different manufacturing organizations in Penang, Malaysia were requested to rate this list. The profile of the 10 organizations is presented in Table 2.

Table 2: Profile of the organizations

Company	Country of Origin	Number of Employees	Products	Duration ERP Implemented
1	Foreign	3500	Hard disc	8
2	Foreign	1500	LED's and Philips Lighting	4
3	Foreign	8000	Network Communication	8
4	Foreign	800	Tape Drive	5
5	Local	4300	Wafer	3
6	Foreign	600	Audio	4
7	Foreign	1500	RF products, electronics	3
8	Foreign	2200	Circuit board maker	4
9	Foreign	3500	Network communication	7
10	Foreign	7500	LED's & display, RF microwave & wireless components	5

**Legend:**

Studies: a: Somers & Nelson, (2001); b: Stratman & Roth, (2002); c: Al-Mudimigh, Zairi & Al-Mashari, (2001); d: Nah, Zuckweiler & Lau, (2003); e: Esteves-Sousa & Pastor-Collado, (2000); f: Akkermans & Helden, (2002); g: Zhang, Lee, Zhang & Banerjee, (2002); h: Nah & Lau, (2001); i: Holland,

Result of the survey can be found in the Table 3, with the top 10 CSF's italicized.

The profile shows that these companies have implemented ERP between 3 to 8 years. Thus the experience gained from the implementation would be most valuable when rating the critical success factors.

Table 3: Ranking of Critical Success Factors

Critical Success Factors	Mean Rank
<i>Top management support</i>	2.00
<i>Business Plan &amp; Vision</i>	2.30
<i>Teamwork &amp; Composition</i>	6.70
<i>Project management</i>	7.50
<i>Project champion</i>	8.00
<i>Learning competency</i>	8.40
<i>User training and education</i>	9.40
<i>Change readiness</i>	9.70
<i>Vendor support</i>	12.30
<i>Communication</i>	12.45
Clear Goals & Objective	13.00
Use of steering committee	13.20
Data analysis & conversion	14.80
Monitoring and evaluation of performance	15.15
Management of expectations	15.30
Business Process Reengineering	16.20
Partnership with vendor	16.85
Careful package selection	16.95
Empowered decision makers	17.30
Education on new business processes	17.30
Use of consultants	17.70
Architecture choices	18.50
Use of vendors' tools	20.10
Minimal customization	20.60
Organizational Trust between partners	20.60
Appropriate business and IT legacy systems	22.50
Strategic IT Planning	23.20

**Note: Lower rank means the factors is consistently ranked important as the ranking is based on 1=the most important with 27=the most unimportant.**

From Table 3, it can be seen that the top 10 critical success factors identified are Top management support, Business Plan & Vision, Teamwork & Composition, Project management, Project champion, Learning competency, User training and education, Change readiness, Vendor support and Communication. The Friedman test was significant ( $\chi^2 = 135.35, p < 0.01$ ) indicating that the managers ranked the 27 critical factors differently with some ranked much more important as compared to the others.

Next a concordance test (Table 4) was run to test whether the raters, ie; the 10 managers agreed on the importance rating for each of the factor. If the concordance coefficient is closer to 1 then we can conclude that there is total agreement and if the value is close to 0 then there is no agreement at all. The Kendall's W test was significant ( $\chi^2 = 135.35, p < 0.01$ ) with a coefficient of 0.621 (a value closer to 1 indicates total agreement). Thus we can conclude that the 10 most important critical success factors identified are common factors that the ten managers mutually agreed upon.

Table 4: Test of Concordance

	Critical Success Factors	Mean Rank
1	Top management support	2.00
2	Clear goals and objectives	2.30
3	Project team competence	6.70
4	Dedicated resources	7.50
5	Project management	8.00
6	Business plan and vision	8.40
7	Project champion	9.40
8	Interdepartmental cooperation	9.70
9	Careful package selection	12.30
10	Empowered decision makers	12.45
11	Vendor support	13.00
12	Interdepartmental communication	13.20
13	Use of steering committee	14.80
14	Monitoring and evaluation of performance	15.15
15	Data analysis and conversion	15.30
16	Management of expectations	16.20
17	Partnership with vendor	16.85
18	Business Process Reengineering	16.95
19	Change management	17.30
20	User training on software	17.30
21	Education on new business processes	17.70
22	Use of consultants	18.50
23	Architecture choices	20.10
24	Use of vendor tools	20.60
25	Minimal customization	20.60
26	Organizational trust between partners	22.50
27	Appropriate business and IT legacy system	23.20

Note: In concordance testing we are interested in the agreement/disagreement between the raters on one factor as opposed to the Friedman test whether the comparison is between the 27 factors on the raters.

## DISCUSSION AND CONCLUSION

The purpose of this exploratory research was to identify a smaller number or manageable number of critical success factors that can be further developed for a formal study on successful implementation of ERP systems in Malaysia. The exploratory study found ten critical success factors which are Top management support, Business Plan & Vision, Teamwork & Composition, Project management, Project champion, Learning competency, User training and education, Change readiness, Vendor support and Communication which are directly relevant and critical in the Malaysian environment.

The results are consistent with the literature and enhance the understanding of the critical success factors leading to ERP implementation success. Appropriate resources should be allocated to each of these factors to reduce the likelihood of ERP implementation failures [Nah et al.<sup>vi</sup>, 2003]. Thus the next step will be for a formal study to be carried out developing a proper instrument to measure the 10 critical success factors identified.

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