

Identification of progress and success factors during implementation of Enterprise Resource Planning Package in Indian Steel Industry - A case study on Bhilai Steel Plant

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Abstract— Although the phenomenal recognition of Enterprise Resource Planning (ERP) tool as reported in various practitioner magazines, there has been little academic research published to date about critical success factors related to ERP adoption and implementation in Indian steel industries. In this study the authors have concentrated on critical success factors (CSFs) of ERP implementation in Indian steel industry. This research provides preliminary findings from an interview conducted at Bhilai Steel Plant, Chhattisgarh. A series of interviews were conducted on selected top management, middle management and end users to identify most critical success factors (CSFs) that are able to enhance the progress and success for Bhilai Steel Plant. All interviewees have adopted ERP implementation progress is associated with the identification of critical success factors before and after the implementation. The identified critical success factor will be considered in developing model of ERP tool development for Indian steel industry.

Index Terms— BPR, CSFs, ERP, MES, SAP.

I. INTRODUCTION

The enterprise resource planning (ERP) system is a common term for a wide set of activities supported by multi-module application tool that helps organizations to manage their resources in better way. The ERP system has been shown to be able to provide significant improvements in efficiency, productivity and service quality, and to lead to a reduction in service costs as well as to more effective decision-making.(E.W.T. Ngai et.al. 2008). ERP implementations are usually large, complex projects, involving large groups of people and other resources, working together under considerable time pressure and facing many unforeseen developments (H. Akkermans et.al. 2002). ERP provides two major benefits that do not exist in non-integrated departmental systems: (1) a unified enterprise view of the business that encompasses all functions and departments, and (2) an enterprise database where all business transactions are entered, recorded, processed, monitored, and reported. (Elisabeth J. Umble et al., 2003). The available data and data analysis indicates that the vital Critical Success Factors (CSFs) to implement ERP package successfully. This paper provides a technique to identify CSFs and suggest method to manage the same.

II. LITERATURE REVIEW

The concept of CSFs was first proposed by D. Ronald Daniel (1961) and refined and popularized by John F. Rockart of MITs Sloan School of management, nearly 20 years later. Implementing an ERP system is not an inexpensive or risk-free venture. 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 (Elisabeth J. Umble et al., 2003). Al-Mashari and Al-Mudimigh in describes a case study of a failed implementation of SAP R/3 to re-engineer the business processes of a major manufacturer. They point out that the change management is one of the main factors that led to failure in ERP implementation. In fact, many cases of the failure to implement ERP because of either cancellations or cost/time over runs have been reported . The effective implementation of an ERP system requires change management strategies and an understanding of organizational culture [5]. Change management involves the effective balancing of forces in favor of a change over forces of resistance. There are many important processes and tools in change management [17]. The previous studies present different techniques and strategies have been used in change management also the authors in those previous studies used different processes, methods, and tools to change organization without any resistance and make the employee accept the new ERP system (Hala M.Al-Shamlan et al., 2011).It is therefore worthwhile to examine the factors that, to a great extent, determine whether the implementation will be successful. These factors, often referred to as critical success factors (CSFs) are as Rockhart (1979) explained are “Areas of activity that should receive constant and careful attention from management”, (Almahidi.M.S. Ibrahim et al., 2008). The literature has cited a surplus of Critical Success Factors that can affect the success or failure of the implementation of an ERP system in an organisation.

Table-I: Summary of most prominent Critical Success Factors for the ERP implementation

Critical Success Factors	Author's Name
Top management support	Fiona Mary Sumner 2000, Toni M. Somers <i>et al.</i> 2001, H Akkermans <i>et al.</i> 2002, Elisabeth J. Umble <i>et al.</i> 2003, Fui-Hoon Nah <i>et al.</i> 2003, Liang Zang <i>et al.</i> ,2003, Toni M. Somers <i>et al.</i> 2004, T.R. Bhatti 2005, Sherry Finney <i>et al.</i> 2007, Ngai <i>et al.</i> 2008, Wui-Gee Tan <i>et al.</i> ,2009, Stehan A. Kronbichler <i>et al.</i> 2009,
Project team competence	Mary Sumner 2000, Toni M. Somers <i>et al.</i> 2001, H Akkermans <i>et al.</i> 2002, Vinod Kumar <i>et al.</i> ,2003,Fiona Fui-Hoon Nah <i>et al.</i> 2003, T.R. Bhatti 2005, Robert Plant <i>et al.</i> 2007, Sherry Finney <i>et al.</i> 2007, Ngai <i>et al.</i> 2008, Stehan A. Kronbichler <i>et al.</i> 2009,
Interdepartmental cooperation	Mary Sumner 2000, Toni M. Somers <i>et al.</i> 2001, H Akkermans <i>et al.</i> 2002, Toni M. Somers <i>et al.</i> 2004, Robert Plant <i>et al.</i> 2007, Stehan A. Kronbichler <i>et al.</i> 2009,
Clear goals and objectives	Toni M. Somers <i>et al.</i> 2001, H Akkermans <i>et al.</i> 2002, Elisabeth J. Umble <i>et al.</i> 2003, Fiona Fui-Hoon Nah <i>et al.</i> 2003, Toni M. Somers <i>et al.</i> 2004, T.R. Bhatti 2005, Robert Plant <i>et al.</i> 2007, Sherry Finney <i>et al.</i> 2007, E.W.T. Ngai <i>et al.</i> 2008, Stehan A. Kronbichler <i>et al.</i> 2009,
Project management	Appuswamy 2000, Mary Sumner 2000, Toni M. Somers <i>et al.</i> 2001, H Akkermans <i>et al.</i> 2002, Elisabeth J. Umble <i>et al.</i> 2003, Liang Zang <i>et al.</i> ,2003, Toni M. Somers <i>et al.</i> 2004, T.R. Bhatti 2005, Mary Sumner Robert Plant <i>et al.</i> 2007, Robert Plant <i>et al.</i> 2007, Sherry Finney <i>et al.</i> 2007, Ngai <i>et al.</i> 2008, Wui-Gee Tan <i>et al.</i> ,2009, Stehan A. Kronbichler <i>et al.</i> 2009,
Interdepartmental communication	Mary Sumner 2000, Toni M. Somers <i>et al.</i> 2001, H Akkermans <i>et al.</i> 2002, Fiona Fui-Hoon Nah <i>et al.</i> 2003, Toni M. Somers <i>et al.</i> 2004, T.R. Bhatti 2005, Sherry Finney <i>et al.</i> 2007, Ngai <i>et al.</i> 2008, Stehan A. Kronbichler <i>et al.</i> 2009.
Management of expectations	Toni M. Somers <i>et al.</i> 2001, H Akkermans <i>et al.</i> 2002, Toni M. Somers <i>et al.</i> 2004, Robert Plant <i>et al.</i> 2007, Ngai <i>et al.</i> 2008,
Project champion	Mary Sumner 2000, Toni M. Somers <i>et al.</i> 2001, H Akkermans <i>et al.</i> 2002, Fiona Fui-Hoon Nah <i>et al.</i> 2003,Robert Plant <i>et al.</i> 2007, Sherry Finney <i>et al.</i> 2007, Sherry Finney <i>et al.</i> 2007, Ngai <i>et al.</i> 2008, Wui-Gee Tan <i>et al.</i> ,2009, Stehan A. Kronbichler <i>et</i>

	al.2009.
Vendor support	Toni M. Somers <i>et al.</i> 2001, H Akkermans <i>et al.</i> 2002 Liang Zang <i>et al.</i> ,2003, Toni M. Somers <i>et al.</i> 2004, Ngai <i>et al.</i> 2008, Stehan A. Kronbichler <i>et al.</i> 2009,
Careful package selection	Toni M. Somers <i>et al.</i> 2001, H Akkermans <i>et al.</i> 2002, Toni M. Somers <i>et al.</i> 2004,Robert Plant <i>et al.</i> 2007, Sherry Finney <i>et al.</i> 2007,
Data analysis & conversion	Toni M. Somers <i>et al.</i> 2001, Elisabeth J. Umble <i>et al.</i> 2003, Liang Zang <i>et al.</i> ,2003, Toni M. Somers <i>et al.</i> 2004, Thomas F. Gattiker <i>et al.</i> 2005, Robert Plant <i>et al.</i> 2007, Sherry Finney <i>et al.</i> 2007, Ngai <i>et al.</i> 2008, Wui-Gee Tan <i>et al.</i> ,2009,
Dedicated resources	Toni M. Somers <i>et al.</i> 2001, Robert Plant <i>et al.</i> 2007,
Use of steering committee	Toni M. Somers <i>et al.</i> 2001, Robert Plant <i>et al.</i> 2007,
User training on software	Appuswamy 2000, Mary Sumner 2000, Toni M. Somers <i>et al.</i> 2001, Elisabeth J. Umble <i>et al.</i> 2003, Liang Zang <i>et al.</i> ,2003, Vinod Kumar <i>et al.</i> ,2003, Toni M. Somers <i>et al.</i> 2004, T.R. Bhatti 2005,Sherry Finney <i>et al.</i> 2007, Stehan A. Kronbichler <i>et al.</i> 2009,
Education	Toni M. Somers <i>et al.</i> 2001, Elisabeth J. Umble <i>et al.</i> 2003, Mary Sumner 2000, Robert Plant <i>et al.</i> 2007, Sherry Finney <i>et al.</i> 2007, T.R. Bhatti 2005, Toni M. Somers <i>et al.</i> 2004, Liang Zang <i>et al.</i> ,2003,
Business Process Reengineering	Toni M. Somers <i>et al.</i> 2001, Fiona Fui-Hoon Nah <i>et al.</i> 2003, Liang Zang <i>et al.</i> ,2003, T.R. Bhatti 2005, Thomas F. Gattiker <i>et al.</i> 2005, Robert Plant <i>et al.</i> 2007, Sherry Finney <i>et al.</i> 2007, Ngai <i>et al.</i> 2008, Stehan A. Kronbichler <i>et al.</i> 2009,
Minimal customization	Toni M. Somers <i>et al.</i> 2001, Robert Plant <i>et al.</i> 2007,
Architecture choices	Toni M. Somers <i>et al.</i> 2001, Robert Plant <i>et al.</i> 2007,
Change management	R.Appuswamy 2000, Toni M. Somers <i>et al.</i> 2001, Fiona Fui-Hoon Nah <i>et al.</i> 2003, Elisabeth J. Umble <i>et al.</i> 2003, Vinod Kumar <i>et al.</i> ,2003, Toni M. Somers <i>et al.</i> 2004, T.R. Bhatti 2005, Zafar U.Ahmed <i>et al.</i> 2006, Robert Plant <i>et al.</i> 2007, Ngai <i>et al.</i> 2008, Stehan A. Kronbichler <i>et al.</i> 2009, Hala M.Al-Shamlan <i>et al.</i> 2011,
Partnership with vendor	Toni M. Somers <i>et al.</i> 2001, Toni M. Somers <i>et al.</i> 2004, Robert Plant <i>et al.</i> 2007, Wui-Gee Tan <i>et al.</i> ,2009,

Use of vendors' tools	Toni M. Somers <i>et al.</i> 2001, Robert Plant <i>et al.</i> 2007,
Use of consultants	Toni M. Somers <i>et al.</i> 2001, Toni M. Somers <i>et al.</i> 2004, T.R. Bhatti 2005, Robert Plant <i>et al.</i> 2007, Sherry Finney <i>et al.</i> 2007,
Appropriate Business and IT Legacy Systems	Fiona Fui-Hoon Nah <i>et al.</i> 2003, Vinod Kumar <i>et al.</i> ,2003,Sherry Finney <i>et al.</i> 2007, Stehan A. Kronbichler <i>et al.</i> 2009,
Post-implementation Focus	Thomas F. Gattiker <i>et al.</i> 2005, Stehan A. Kronbichler <i>et al.</i> 2009,
Monitoring and Evaluation of Performance	Fiona Fui-Hoon Nah <i>et al.</i> 2003, Sherry Finney <i>et al.</i> 2007,
Software Development, Testing, and Troubleshooting	Fiona Fui-Hoon Nah <i>et al.</i> 2003, Sherry Finney <i>et al.</i> 2007,
Management of Risk	T.R. Bhatti 2005,
User Involvement	Liang Zang <i>et al.</i> ,2003,T.R. Bhatti 2005, Stehan A. Kronbichler <i>et al.</i> 2009,

According to Rockart (1979), critical success factors (CSFs) are the “few keys areas that must go right for the business to flourish”. If they are not performed well, it is unlikely that the mission, objectives or goals of a business or project will be achieved. A comprehensive, well-grounded list of CSFs and case studies of ERP implementations in U.S. companies was developed by Somers and Nelson (2001). Toni M. Somers *et al.* 2001 have suggested the impact of Critical Success Factors (CSFs) across the stages of Enterprise Resource Planning (ERP) implementations. The result of this research provides an advice to management on how best to utilize their limited resources to choose those CSFs that are most likely to have an impact upon the implementation of the ERP system.

III. RESEARCH OBJECTIVE

Objective of this research work

1. To identify the most Critical Success Factors for the effective implementation of ERP package in Indian steel sector i.e. Bhilai Steel Plant.
2. To identify the impact of that most Critical Success Factors within the organisation to avoid any bottlenecks in the effective implementation of ERP package to enhance the production, productivity and effectiveness of the organisation.

IV. RESEARCH DESIGN

As Yin (1989) mentions, a research design in a case study is a technical plan that attempts to link the beginning and end of a research study, helping the researcher to get from “here” to “there”. There are then five important aspects of a research design: (1) The study’s questions, (2) Its propositions, if any, (3) Its units of analysis, (4) The logic linking the data to the propositions, and (5) The criteria for

interpreting the findings. (Ioannis Ignatiadis- Ph.D. Thesis).A preliminary literature review revealed an interview protocol that had been developed and used in a study of ERP implementation in Bhilai Steel Plant. Chart-1 shows various steps involved for this research work.

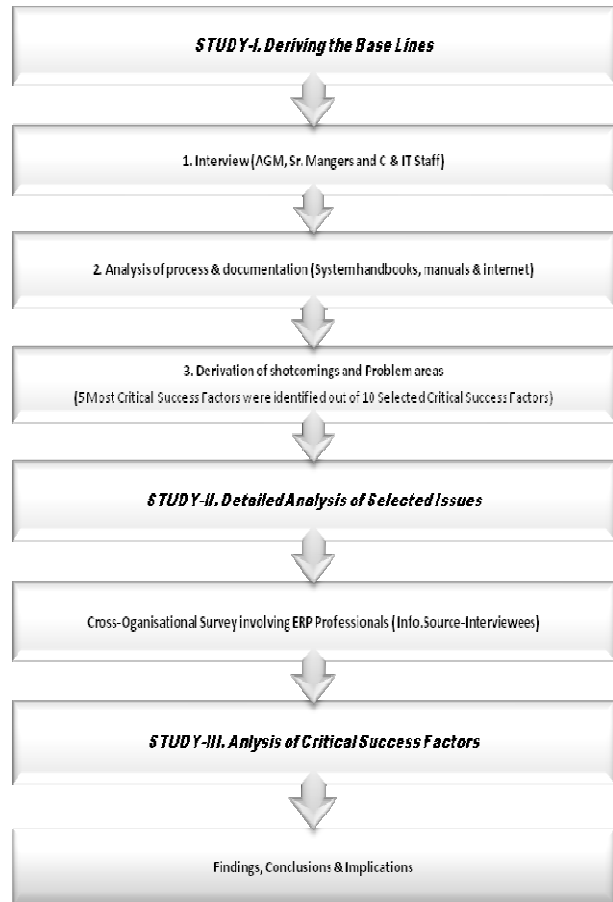


Fig.1. Research Design- Strategy for the research work

V. PROFILE OF CASE ORGANIZATION-BHILAI STEEL PLANT

Bhilai Steel Plant (BSP) is the flagship unit of Steel Authority of India Limited, the largest producer of steel in India and one of the leading players worldwide. According to World Steel Dynamics, SAIL with a turnover exceeding \$10 billion—ranks second in the league of ‘world class’ steel makers evaluated in terms of a slew of performance measurement yardsticks. Currently producing five MT of steel, BSP—the largest in the SAIL family after a capacity expansion program that's currently underway—is set to produce seven MT of crude steel per annum by 2012. (Source: Express computer, business weekly Aug 02,2010).Ten - times winner of Prime Minister's Trophy for best Integrated Steel Plant in the country, Bhilai Steel Plant (BSP) Chhattisgarh is India's sole producer of rails and heavy steel plates and major producer of structural. Since BSP is accredited with ISO 9001:2000 Quality Management System Standard. At Bhilai ISO:14001 have been awarded for Environment Management System in the Plant. BSP has

bagged the CII-ITC Sustainability award for three consecutive years. (Source: SAIL-Newsflash)

VI. IMPLEMENTATION OF ERP SAP IN BSP

BSP has successfully launched six modules (Fig.No.-1) of ERP SAP (Systems Applications and Products in Data Processing) according to Big Bang theory.

Past studies have identified a variety of CSFs for ERP implementation, among which context related factors inconsistently appear. The case study approach attempts to capture and communicate the reality of a particular surroundings at a point in time (Jenkins, 1985). According to Walsham (1995) in the case of an outside observer in interpretive case studies, interviews are the primary data sources, since this is the best way to access the interpretations and views of the respondents. In interpretive study the data collected are mostly qualitative. If the interviews are too closely directed, important data may be lost, and hence the richness of interpretation which is very important in interpretive case studies is lost [18]. On the other hand, over-submissive, i.e. by not offering the researcher’s own ideas or by not prompting with questions following a new direction taken by the interviewee, may lead to the conclusion by the interviewees that (1) the researcher is not interested in interview, (2)The researcher has no vision of his/her own regarding the subject in question. Regarding recording of interviews, Walsham (1995) stated that tape-recording interviews can provide a full transcript of what was said, interview subjects may be reserved on the sight of a tape-recorder regarding sensitive or confidential material. The disadvantage of full tape-recording is the time needed to write down the interviews or to extract something meaningful out of them. The alternative to tape-recording is to make a widespread note during the interview and to write them up fully as soon as possible after the interview [18]. The data for this research are purely qualitative, collected by means of semi-structured interviews. The interviewees were asked some open-ended questions according to written interview guidance notes, but they were free to elaborate on their own thoughts. The interviewees in BSP were selected according to their degree of involvement with the ERP system, as well as selecting a cross-section of users and managers from various departments. The interview questions have been based on determining the CSFs in Implementation of ERP, SAP in Bhilai Steel Plant, and the executives of BSP were free to ask some questions and answer the selected questions. The most CSFs identified by executives and are significant for the success of ERP implementation in Bhilai Steel Plant (BSP) is tabulated in table no.-2. Table 2 is shown in Appendix .it describes Weightage of Critical Success Factors. Figure 4 shows Weightage of critical Success Factors and Figure 5 shows Executive wise Importance of CSF’S



Fig.2. ERP Modules in BSP (Source: Metal Asia, June 2010)

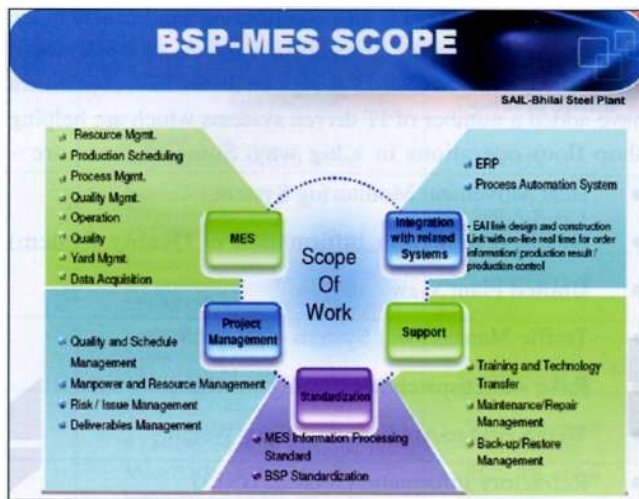


Fig.3. Structure of MES in (Source: Metal Asia, June 2010)

Following the 1st April 2009 ‘Go-Live’ of all SAP modules-supported by many other technology modules –All the plant’s business operations are ‘happening live” on the ERP platform, without any interruption. The ERP project is being followed by Manufacturing Execution system (MES) project. Bhilai Steel Plant, the first PSU integrated Steel Plant to have successfully implemented Enterprise Resource Planning (ERP) SAP, has now taken up the implementation of MES (Fig No.-2) for improvisation in production scheduling and optimization of manufacturing operations (Source: Annual report 2010 BSP).

VII. DATA COLLECTION AND ANALYSIS

The interviewees in BSP were selected according to their degree of involvement with the ERP system, as well as selecting a cross-section of users and managers from various departments. The interview questions have been based on determining the CSFs in Implementation of ERP, SAP in Bhilai Steel Plant, and the executives of BSP were free to ask some questions and answer the selected questions. The most CSFs identified by executives and are significant for the success of ERP implementation in Bhilai Steel Plant (BSP) is tabulated in table no.-2. Table 2 is shown in Appendix .it describes Weightage of Critical Success Factors. Figure 4 shows Weightage of critical Success Factors and Figure 5 shows Executive wise Importance of CSF’S

As per above available data from the Bhilai Steel Plant, Chhattisgarh, among top ten vital Critical Success Factor namely Top Management, Change management, Vendor support, User training and Education, Customization, Careful package selection, Project team competence, Business Process Reengineering, Use of consultants and Interdepartmental communication and cooperation (Figure 3.), Change Management was mostly emphasized by the executives.

- Six business areas of BSP were covered through seventeen different modules of SAP.
- 200 as-is processes mapped to 140 to-be processes in ERP after rationalization.
- More than 650 unit tests were carried out to ensure working of the software.
- 174 scenarios were tested during integration testing of the software.
- 647 developments were carried out in the system to suit the plant's specific needs.
- Involvement of sister plants in detailed designing Implementation Highlights (Source: Metal Asia, June 2010).

VIII. CONCLUSION

Enterprise Resource planning (ERP) package gives a common platform for sharing information and helping higher management to fulfill the target and take quick decision. Identification of critical success factors was the challenging job for the implementation of ERP in Bhilai Steel Plant (BSP). The outcomes of interviews among top management, middle management and end users illustrate that identifying the most CSF was a primary concern in ERP implementation in BSP. In this research, five most critical success factors are identified as per their rankings. In order to facilitate a smooth ERP implementation, organizations must be competent with these CSFs. The study indicates that managing these CSFs effectively by acknowledging importance to employees concern, having regular and open communication, get everyone's participation, and promote skills and development are some of the ways to manage these issues. The study has proved that efficient change management is one of the critical success factors to successful implementation of ERP package in BSP. Change management initiatives were found to be positively related to user satisfaction. Many training and education system were developed to involve the end users and to manage resistance to change. According to this study, top management support and vendor selection stands in second and third position respectively. An organisation must learn to identify various CSFs that greatly affect the ERP implementation and identify when in the process to address the end users effectively to ensure that the pledged gain can be comprehended and the ERP package can be implemented successfully.

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APPENDIX

Table-2: Weightage of Critical Success Factors

S.N	Critical Success Factors	Executives						AVE in %	Rank
		1	2	3	4	5	6		
1	Top Management Support	100	100	90	90	100	95	96.67	2 nd
2	Change management	100	100	100	100	95	100	99.17	1 st
3	Vendor support	90	100	90	100	100	95	95.83	3 rd
4	User training and Education	95	90	95	90	95	90	92.50	7 th
5	Customization	95	90	95	80	90	90	90.00	8 th
6	Careful package selection	100	90	75	90	85	90	88.33	9 th
7	Project team competence	100	95	90	95	95	95	95.00	4 th
8	BPR	90	95	95	95	95	95	94.17	5 th
9	Use of consultants	80	75	85	75	95	80	81.67	10 th
10	Interdepartmental comm. and cooperation	85	90	100	90	90	90	90.83	6 th

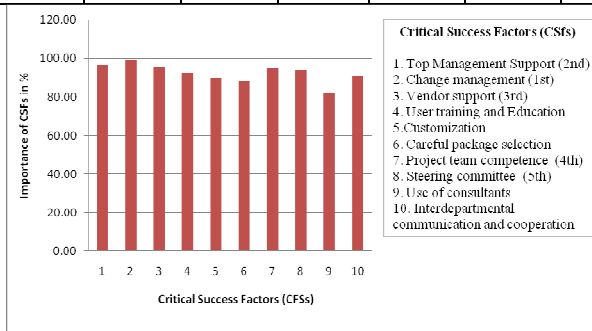


Fig.4. Weightage of critical Success Factors

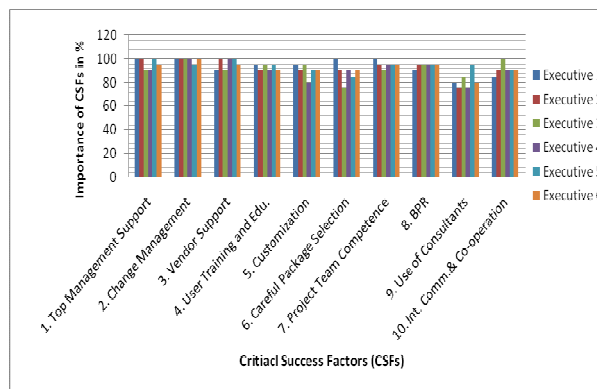


Fig.5. Executive wise Importance of CSFs