User Satisfaction as a Measure of Organizational Effectiveness: A Study in Bhilai Steel Plant During ERP Implementation

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ABSTRACT: In order to ensure successful achievement of organizational objectives with the help of the Enterprise Resource Planning (ERP), a tool for bringing about organizational change, it is important for the company to ensure that the employees who are finally going to run the new system are satisfied by it. Though there are innumerable ways of evaluating ERP performance, in this paper, we have restricted our study to a qualitative evaluative dimension of organization effectiveness and that is, user satisfaction. Literature survey reveals that user satisfaction is a critical success factor for the successful implementation of a new system like Enterprise Resource Planning. The study was conducted in Bhilai Steel Plant (BSP), a flagship unit of SAIL (SAIL with a turnover exceeding $10 billion, ranks second in the league of world class steel makers by World Steel Dynamics, and Bhilai Steel Plant is the maximum profit making unit of SAIL). The study reveals that the employees are satisfied by the new implemented system, ERP. The most significant factors are the product's capabilities and their own personal knowledge and understanding of the system in bringing about user satisfaction. User satisfaction plays a significant role in ERP usage and both User satisfaction and ERP usage are significant for organization's effectiveness.

I. INTRODUCTION

Organizations trying to develop competitive edge using IT enabled solutions like ERP need to evaluate the organization's effectiveness after implementing them. Though there are many ways, both qualitative and quantitative available to evaluate organizational effectiveness. In this paper we will be concentrating on user satisfaction.

A. BSP's position in Global Steel Industry

Bhilai Steel Plant (BSP) is a flagship unit of SAIL, the largest producer of steel in India. SAIL has recently accorded the status of 'Maharatna' by the Government of India. According to World Steel Dynamics, SAIL, with a turnover exceeding $10 billion, is ranked second in the league of world class steel makers [25]. Currently producing five MT of steel, BSP is the largest in the SAIL family after a capacity expansion program that's currently underway and is set to produce seven MT of crude steel per annum by 2012 [26]. Bhilai Steel Plant (BSP) decided to go in for ERP implementation to increase competitive advantage in 2007.

B. Why Organizational Effectiveness ?

Enterprise Resource Planning (ERP) performance studies are undertaken by organizations to know the effectiveness or evaluate the benefits brought about by ERP, a tool used for bringing about organizational transformation. ERP evaluation is an important step that helps in analyzing the contribution of ERP to an Organization.

One of the objectives of ERP performance evaluation is to determine the effectiveness of ERP project to ensure that outcomes conform to the business needs, user needs and organizational goals thereby helping in achieving the very objectives for which it was adopted.

Effectiveness of implemented ERP solution can be measured by linking it with the achievement of organization's goals and the satisfaction of all the stakeholders of the organization.

There are innumerable means of evaluating ERP performance. Each come with their own set of them has their own advantages and disadvantages. We have restricted to user satisfaction and ERP usage to study organizational effectiveness.

C. Organizational Effectiveness and user satisfaction

Every employee in his or her way can contribute to organizational effectiveness. Depending upon their expertise, skills, attitude, experience, creativity, motivation etc. some may play a bigger role than others.

Powers and Dickson (1973) studied the factors affecting the success of management information systems [1]. They identified user satisfaction as one of the key factors affecting management information systems success.

Robert W. Smyth, (2001) conducted a research in Corporate Administration Agency (CAA) of the Queensland State Government, in Brisbane, Australia, which had implemented ERP and reported that ERP failed due to less user satisfaction [2].

DeLone and McLean (2003) focused on the user satisfaction of the information system. The more satisfied will be a user with the new system more will be the usage leading to better organizational performance and efficiency. It was viewed as a critical factor for evaluating a systems success [3]. Moreover, User satisfaction can be defined as the extent of which users believe the information system available to them meets their information and system requirements. DeLone and McLean (2003) found that the

user satisfaction was related to the system quality, information quality [3].

User Satisfaction is one of the most extensively used single measure for IS evaluation [4],[5],[6],[7],[8]. User

Satisfaction can be defined as the "sum of one's feeling's or attitudes toward a variety of factors affecting that situation in a given situation" [9].

D. Dimensions of User Satisfaction

Table 1.

Author	Dimensions of User satisfaction
Ives et al., 1983 [10];	information product, user knowledge and involvement, contractor service, and Management information department staff service.
Raymond, 1987 [11],	
Sengupta and Zviran, 1997 [12]	
Bendoly and Jacobs, 2004 [13]	Reliability, Relevance, Accuracy, Precision, Completeness, Timeliness, Ease of
Bingi et al. 1999 [4]	use, Output, Bingi et al., 1999; [14]
Van Everdingen et al., 2000 [15];	Information age
Holsapple et al., 2005 [16];	Usefulness, System integrity, system flexibility
Kennerley and Neely, 2001 [17];	
O'Learny, 2000 [18];	
Ross, 1999 [19]	
DeLone and McLean 2003 [3]	System quality, information quality
Bailey and Pearson, 1983; [9]	Training, System understanding, User participation, Top management involvement, and documentation, convenience of access
Ives et al., 1983; [10]	
Raymond, 1987; [11]	
Sengupta and Zviran, 1997 [12]	
Doll and Torkzadeh (1988) [4]	content, accuracy, format, ease of use, and timeliness
Loiacono, et.al (2002) [20]	Ease of understanding ,intuitive operation, Tailored communication, trust, information fit to task, visual appeal, innovativeness, Response time
Chin, et.al (1988) [21]	Usability, fulfillment of end user needs, system capabilities, Layout, accuracy, format, preciseness

According to the literature survey, many factors influence the satisfaction of employees with respect to new system implementation like ERP, but in our study we have categorized the factors influencing user satisfaction into three heads i.e;

1. Core team/ Consultant Team's interaction and expertise
2. ERP Product's features and capability
3. Employee's knowledge and understanding of the system.

a. Core/consultant team

Level of Interaction: Effective and high level of interaction between the ERP consultants/ Core Team and the employees will be helpful in thwarting the misinterpretations lurking in the minds of the employees about ERP, thereby boosting the confidence level about the new package and hence, the satisfaction level goes up.

Communication: Literature review suggests that communication is one of the most critical factors for the successful implementation of ERP. Proper 2-way communication between employees and consultant/core team will result in exchange of information thereby motivating the employees who will show better ERP implementation results, adding to organization's effectiveness.

Knowledge & Expertise: The domain knowledge and expertise of core team/Consultants enable the employees to come out of difficult situations easily. Their expertise and

knowledge help the employees not to re-invent the wheel and understand those aspects which may not be found in the standard documentations. Their knowledge level help the employees have confidence in them, which may lead to satisfaction with the new system and remove the barriers regarding ERP usage so that employees feel satisfied with the new ERP system.

Willingness to Support: Assistance and willingness to support the employees is an important factor for user satisfaction coz, until the day-to-day problems are addressed immediately and effectively the willingness to try new things in the system will not be there.

Training: Trainings arranged by the core team/ consultants for the benefit of the employees must be effective and knowledgeable enough to create comfort zone between the employees and the new system and help to increase the user expertise and guide them in effectively utilizing the new system and motivating them in using the new system.

Response Time: The response time of answering the problems and for any request presented by a user towards the core team should be prompt and in accordance to the need in order to support user with ERP project in relation to ERP usage satisfaction.

User Manuals: User manuals provided to users for working on the ERP system should be worthy, easy and beneficial enough for the employees to be able to work with the new system with less help.

b. ERP product

The IS quality is always the important determinant of user satisfaction and perceived success in an IS context [3].

Output information: Results and output information like reports, printouts provided by ERP product should be worthy and easy to understand by the user and according to the requested given so that satisfaction about the ERP product can be calculated and its implementation.

Flexibility: ERP products should be flexible enough to adapt to future changes and new conditions.

Stable: ERP product should be stable and robust to make ERP implementation a successful project.

Cross functionality: ERP product should have the quality of cross functionality so that it can establish relation of effective communication with systems of other functional areas. Easy exchange of information between the different departments of the organization using ERP should be made so that, users feel satisfied with the use of ERP project.

Reports: layout and design of output information provided by the ERP product should be flexible, clear, and informative so that user feel satisfied with the result of ERP product and will consider ERP as a beneficiary instrument.

C. Employees Knowledge and understanding

Perceived ease of use: They should have enough training and knowledge to find using ERP system easy to use, so that they can establish easy relation with the ERP project and contribute in successful ERP implementation for better organization effectiveness.

Perceived usefulness: Employees should understand the contribution of ERP towards their working so that it becomes easy for them to use the ERP. They must be able to realize and understand the usefulness and benefits of the ERP project which will result in satisfaction among the employees for successful implementation of ERP project.

Understanding of the functionalities: Employees should understand all the functionalities of ERP with its pros and cons, which will stem out of employees knowledge of the system, so that they can make effective use of it and will provide organization with effective implementation.

II. RESEARCH METHODOLOGY

A. Objective of the study

1. To find out whether the Employees of Bhilai Steel Plant are satisfied by the ERP system, which has been implemented recently
2. To find out which identified dimension plays the most significant role in creating user satisfaction
3. To find out the significance of User satisfaction on ERP usage.
4. To find out the significance of user satisfaction and ERP usage on Organization's effectiveness.

B. Research plan and sampling plan used in the study

Table 2: Research Plan.

Research Design	Descriptive
Research Method Used	Survey
Research Technique Used	Questionnaire
Sampling Unit	Employees (officers) of BSP from selected areas
Sampling Plan	Quota sampling (40%)
Sample Size	178

In this survey the data was collected from the employees of BSP of identified areas. The sample size was 178 which was calculated as –

Table 3.

Name of the department	Total number of employees	40% of total employees
Material management	141	56
Marketing and strategic planning	18	7
Production planning	58	23
Finance and accounting	125	50
Research and control lab	104	42
Total	**446**	178

Table 4: Demographic characteristics of the respondents.

Measure	Items	No of respondents	Total
Age	20-30	33	
	31-40	53	
	41-50	75	**178**
	>50	17	
Gender			
	Male	151	**178**
	Female	27	

C. Hypothesis

H$_1$: There is significant difference among all the selected dimensions taken for the study of user satisfaction as opined by the employees.

H$_2$: The expertise, knowledge and interaction of / with the core team play the most significant role in boosting user satisfaction.

H$_3$: The Products capabilities and functionalities play the most significant role in boosting user satisfaction.

H$_4$: The employees understanding of the ERP system, their comprehension about the business functionalities and information provided by the ERP system in an integrated way plays the most significant role in boosting user satisfaction.

H$_5$: User satisfaction plays significant role in ERP usage

H$_6$: User satisfaction plays most significant role in Organizational effectiveness

H$_7$: ERP usage plays most significant role in Organizational effectiveness
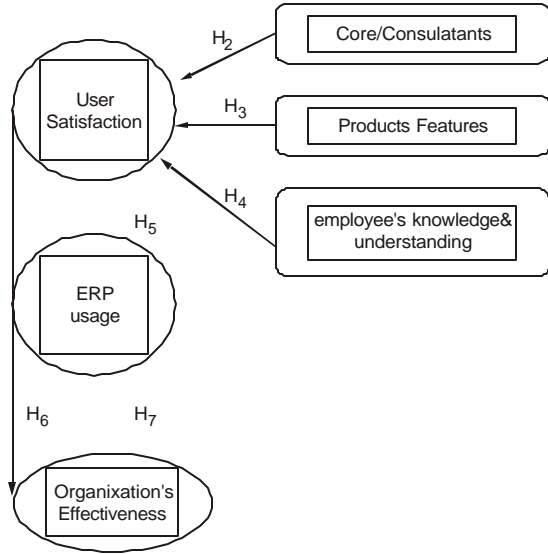
Fig. 1. Research model for User satisfaction & Organizational effectiveness.

III. DATA TABULATION, ANALYSIS AND RESULTS

A. Validating the instrument

Reliability. Close ended questionnaires based on Likert scale were administered to the employees of the organization. When using Likert-type scales it is imperative to calculate and report Cronbach's alpha coefficient for internal consistency reliability for any scales or subscales one may be using [22].

Table 5: Cronbach's Alpha Test value for the Reliability of scale of the Questionnaire.

S.N.	Dimensions	Values for Cronbach's Alpha test
1.	Core/Consultant Team	.678
2.	Product	.701
3.	Employees	.722
4.	*User satisfaction	.811
5.	*ERP usage	.896
6.	*Org. Effectiveness	.834
	OVERALL VALUE	.896

*Dependent variable

Interpretation. Cronbach's alpha test is deemed acceptable when its reliability coefficients exceed the 0.8

level [12]. Our 23 item instrument had a reliability of 0.896. The Cronbach's Alpha test value for the dimension Core/ Consultant Team is comparatively less than the rest i.e. .678, but since, the overall value of Cronbach's Alpha test is .896 ,hence the questions related to Core / Consultant Team has also been kept as a part of the questionnaire.

B. Anova

For testing the first hypothesis one-way Anova was used to find out if there was a difference in opinion of the employees relating to various dimensions of user satisfaction

H₁: There is a significant difference among all the selected dimensions taken for the study of user satisfaction as opined by the employees.

Testing similarity/dissimilarity in the opinion of employees (executive for user satisfaction)

ANOVA

Table 7.

Groups	Count	Sum	Average	Variance
Core/ Consultant's	178	786.4286	4.418138	0.039439
Product's features	178	773.1429	4.343499	0.088652
Employee	178	798	4.483146	0.130599
User satisfaction	178	781.6429	4.391252	0.076911
ERP usage	178	785.9462	4.415428	0.082501
Organization's effectiveness	178	784.9716	4.409953	0.05939

Inference

With department as categorical variable it was found that there is a significant difference in the opinion of the employees for user satisfaction with respect to core/ consultant knowledge and expertise dimension.

C. Linear Regression

a. Testing for the most significant component for user satisfaction

For finding out the most significant factor for user satisfaction as opined by the employees, linear regression was done. The results are as follows :

H₂: The expertise, knowledge and interaction of / with the core team play the most significant role in boosting user satisfaction.

H₃: The Products capabilities and functionalities play the most significant role in boosting user satisfaction.

H₄: The employees understanding of the ERP system, their comprehension about the business functionalities and information provided by the ERP system in an integrated way plays the most significant role in boosting user satisfaction.

Anova

Source of Variation	SS	Df	MS	F	P-value	F crit
Between Groups	1.81908	5	0.363816	4.571599	0.000394	2.222529
Within Groups	84.51586	1062	0.079582			
Total	86.33494	1067				

H₁ is accepted

Testing for the most significant component for user satisfaction

Table 8: Coefficients[a].

Unstandardized Coefficients			Standardized Coefficients		
Model	B	Std. Error	Beta	t	Sig.
1 (Constant)	.010	.007	1.486	.140	
Core team	−.002	.002	−.002	−1.221	.225
Product	.501	.001	.591	475.889	.000
EmpKU	.499	.001	.684	562.724	.000

Dependent variable: User satisfaction

Inference

H$_4$ and H$_3$ are accepted and H$_2$ is rejected.

Since the significant value for both product's capability and employee's knowledge and understanding is coming out to be .000 and it is less than the T value hence, both are playing the most significant role in determining user satisfaction according to the opinion of the employees of Bhilai Steel Plant.

b. Testing for the significance of user satisfaction on ERP usage

For finding out the significant of user satisfaction on ERP usage linear regression was don. The result s are as follows :

H5 : User satisfaction plays significant role in ERP usage.

Table 9: Coefficients[a].

Unstandardized Coefficients			Standardized Coefficients		
Model	B	Std. Error	Beta	t	Sig.
1 (Constant)	3.373	.334		10.089	.000
User satisfaction	.237	.076	.229	3.123	.002

Dependent Variable: ERP usage

Inference

Since the significance value for both user satisfaction and ERP usage is less than .05, both play a significant role in boosting organization's effectiveness. **H$_6$ and H$_7$ are accepted**

Testing for the significance of user satisfaction and ERP usage on OE

Table 10: Coefficients[a].

Unstandardized Coefficients			Standardized Coefficients		
Model	B	Std. Error	Beta	t	Sig.
1 (Constant)	2.077	.319		6.511	.000
User satisfaction	.193	.059	.220	3.258	.001
ERP usage	.336	.057	.396	5.876	.000

a. Dependent Variable:

Organization effectiveness

Inference

Since the significance value for both user satisfaction and ERP usage is less than .05, both play a significant role in boosting organization's effectiveness. **H$_6$ and H$_7$ are accepted.**

IV. DISCUSSION AND CONCLUSION

User Satisfaction for ERP

1.Overall the employees are satisfied with the new ERP system.

2. The most significant dimension according to the opinion of the employees is their own knowlege and understanding of the system and the product's capability equally.

3. User satisfaction is significant for ERP usage.

4. User satisfaction and ERP usage are significant for organization's effectiveness.

S.N.	Hypothesis	Status
1	H$_1$: There is significant difference among all the selected dimensions taken for the study of user satisfaction as opined by the employees.	**Accepted**
2	H$_2$: The expertise, knowledge and interaction of with the core team play the most significant role in boosting user satisfaction.	**Rejected**
3	H$_3$: The Products capabilities and functionalities play the most significant role in boosting user satisfaction.	**Accepted**
4	H$_4$: The employees understanding of the ERP system, their comprehension about the business functionalities and information provided by the ERP system in an integrated way plays the most significant role in boosting user satisfaction.	**Accepted**
5	H$_5$: User satisfaction plays significant role in ERP usage	**Accepted**
6	H$_6$: User satisfaction plays most significant role in Organizational effectiveness	**Accepted**
7	H$_7$: ERP usage plays most significant role in Organizational effectiveness	**Accepted**

There is difference of opinion amongst the employees of different departments, this may be due to their different nature of work procedures.

The study reveals that product's features and User knowledge and involvement are important components of ERP user satisfaction. The lesser the effort required to work on the system, more would be the acceptance. Usefulness perception is the degree to which a person believes that using a particular system would enhance his or her job performance. If the employees perceive a system high in usefulness it will result in a better use and better performance relationship.

The dimension, understanding about the business functionalities and information provided by the ERP system

in an integrated way, stems from self efficacy as well as training imparted to the users during the course of implementation of the new system. In a study conducted in the same organization about the satisfaction with the training imparted to them revealed satisfaction [23], which might have added to user satisfaction with the system also.

The product's features also contribute equally to the user satisfaction. The flexibility, stability, output information are some of the important aspects of the product which adds to user satisfaction.

User satisfaction is important for compelling the end user's to use the system and both satisfaction and usage will lead to organizational effectiveness. Satisfied employees tend to use the system in a better way thereby adding to the organizations effectiveness.

V. Limitations

The research is conducted in a Public Sector Enterprise in India hence; the findings of the study may not be generalized or may have to be adapted according to the organization's environment where the driver of change is similar. According to Melone, 1990 [23], there are other factors also which affect the effectiveness of ERP systems but we have concentrated only on user satisfaction. Non-probabilistic sample design was used; hence there may be sampling errors.

VI. Suggestions

Though the user satisfaction is found to be high in this study, with passage of time this level of satisfaction may change hence, the organization should ensure that the employees remain satisfied by introducing continuous training programs for technical upgradation as well as to increase their analytical skills like creativity.

List of Abbreviations

ERP – Enterprise Resource Planning. SAIL – Steel Authority of India Limited, BSP – Bhilai Steel plant, MT – Million tonnes. US- User satisfaction. OE – Organization Effectiveness, IS – Information system, IT – Information technology

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