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"A Survey Instrument for Identification of the Critical Failure Factors in the Failure of ERP Implementation at Indian SMEs"

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ABSTRACT

Many quantitative and qualitative studies have been conducted in various countries for the Enterprise Resource Planning (ERP) implementation in the Large Enterprise (LEs) as well as for Small and Medium-size Enterprises (SMEs) to capture the full benefits of ERP systems; still there is a lack of survey instrument for identification of the Critical Failure Factors (CFFs) that contribute in the failure of ERP implementation at Indian SMEs. This paper develops an ERP implementation failure survey instrument (questionnaire) by identifying twenty CFFs for the failure of ERP implementation at Indian SMEs that fill the gap of missing survey instrument to explore the CFFs for the failure of ERP implementation at Indian SMEs; it has a broader and more holistic focus. It proposes a framework in terms of one scenario in order to explore the 20 CFFs that determine the failure of ERP implementation at Indian SMEs. A quantitative survey based method was used to collect the data from the Indian ERP consultants (respondents). The data collected were analyzed using statistical techniques. The main purpose of this questionnaire is to get the opinion of respondents in order to explore the CFFs for the failure of ERP implementation at Indian SMEs. It contains 20 survey items. Respondents are required to response on each item (statement) on a likert five point scale of agreement and disagreement. Whole questionnaire is divided in to five parts Cover Letter, General Proforma, Conceptual Framework, Survey Items and One open ended question supported by thank you letter. Findings are discussed for the future work to bridge the current literature gap and provide practical advice for both ERP academics and practitioners.

Key Words: Enterprise Resource Planning (ERP), Critical Failure Factors (CFFs), Indian ERP, Implementation, Small and Medium-size Enterprises (SMEs), ERP Questionnaire

The Instrument Development Process

Following five steps were involved in preparing instruments for the ERP survey:

- Literature Review - Identification of variables (Critical Failure Factors-CFFs) from the literature review of the LEs (Large Enterprise) worldwide ERP implementation failure, in order to explore the CFFs for the failure of ERP implementation at Indian SMEs.
- Theoretical Framework-Seeking an appropriate theory, in order to develop the conceptual framework for the customized survey instrument (questionnaire).
- Collecting Items- 20 survey items were identified to construct survey instrument
- Item Analysis and Editing -20 survey items were analyzed and edited with help of experts opinions
- Standardization of the developed survey instrument for final research by defining scaling (and scoring) rules, reliability test, item analysis, validity test, norms for interpretation and uses.

The Instrument and It's Administration

The main purpose of this questionnaire is to get the opinion of respondents in order to explore the CFFs for the failure of ERP implementation at Indian SMEs. It contains 20 survey items. Respondents are requiring to response on each item (statement) on a Likert five point scales of agreement and disagreement. Whole questionnaire is divided into five parts

- Cover Letter, in order to explain the purpose of the questionnaire in detail along with a request
- General Proforma, in order to get general information related to respondents
- Conceptual framework of survey instrument, while giving the response respondents should restrict them self to the given scenario only
- Survey Items- it deals with 20 close ended statements to explore the CFFs for the failure of ERP implementation at Indian SMEs
- One open ended question in order to explore any new CFFs along with the thank you letter

Conceptual Framework

The instrument is based on Shanks et al. 2000 ERP implementation phases and CFFs approach. Detail conceptual framework is given in third part of the survey instrument (questionnaire).

Scoring

The total score of the survey instrument (questionnaire) based on 20 survey items will range from 20 to 100 on Likert five point scales.

Table 1: Scoring Process (Source: Author, MS Word)

Scoring Based on Likert Five Point Scale	Survey Item	Minimum Score	Maximum Score
Minimum and Maximum Scoring for Each Survey Item	1	1	5
Minimum and Maximum Scoring for all 20 Survey Items	20	20	100

Reliability

For the group of 50 respondents from top 10 companies of IT (ERP) sector the Cronbach's alpha was found to be .792, See Table 2.The data collected on the critical failure factors were first perused to check whether the data could be analyzed using factor analysis or not. The results of this analysis indicate that the correlations among the factors were high and the Bartlett's test of sphericity was significant. The data were hence found suitable to conduct factor analysis. An exploratory factor analysis was conducted on the different measures to purify the instrument & to validate the various dimensions implementation at Indian SMEs. It was also used to examine the response of the fifty Indian ERP consultants in order to define dimensional component of the instrument for ERP implementation at Indian SMEs.

Table 2: The Composite Reliability (Source: SPSS V 18.0)

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.792	.792	20

Table 5 presents the means and standard deviations for the 20 CFFs in descending order (5=Strong agree, 4=Agree, 3= Neutral, 2=Disagree and 1=Strong Disagree). The items used in constructing the survey for this study were adapted from several relevant prior research studies of the large enterprise.

Validity

For the group of 50 respondents from top 10 companies of IT (ERP) sector validity was found to be .8899. The validity was found by using Guilford's formula i.e. by applying the square root of the reliability. Construct validity of the instrument was tested with the help of exploratory factor analysis, See Table 3 and Table 4.It has used principle components as the extraction techniques and the rotation method was Varimax. Only factors with Eigen value (Total variance explained) more than 1 are included in final solutions. Factor loading is simple correlation between the factors & all the variables. It can be used to decide which variable belongs to which factors. This judgment can be done best in rotated factor matrix. Each variables belongs to the factors with which it has the highest loading (neglect the negative sign) See Table 4.This process is used to find out all the constituent variables of each factors. It is seen from the total variance explained table that only 7 factors have Eigen value over 1. It shows cumulative variance of 76.134 % which means a good factor analysis has been done. The factor analysis performed on 20 items resulted into the extraction of 7 components See Table 4.Based on the content of each component they were suitably named. Factor analysis was used to identify the critical failure factors that influence the failure of ERP implementation at Indian SMEs.

- The factors were fixed at seven. See Table 3 and Table 4.
- They together contribute almost 76.134 % of total variance. See Table 3 and Table 4.
- The most important factor among these is Component 1: Technology & Vendor related CFFs, which contribute almost 15.088% of the total variance. See Table 3 and Table 4.
- The variables are divided into different factors based on the values in the rotated component matrix (the higher values are taken). The divisions of variables into different factors are given in See Table 3 and Table 4.

Table 3: Rotated Components Matrix (Source: SPSS V 18.0)

Rotated Component Matrix							
	Component						
Critical Failure Factors	1	2	3	4	5	6	7
CFF 1 Poor consultant effectiveness	**0.828**	0.268	0.067	0.058	-0.145	0.102	0.085
CFF 4 ERP Software misfit	**0.796**	0.296	-0.058	0.28	0.089	0.195	0.085
CFF10 Unrealistic expectations from top management	**0.771**	0.116	0.311	-0.055	0.329	-0.179	-0.075
CFF 6 Over-reliance on heavy customization	**0.668**	0.255	-0.126	0.258	0.305	0.325	0.159
CFF 2 Poor quality of BPR	0.144	**0.874**	-0.095	-0.044	-0.088	0.092	-0.122
CFF 5 High turnover rate of project team members	0.236	**0.873**	0.074	-0.072	-0.104	-0.124	0.017
CFF 7 Poor IT Infrastructure	0.179	**0.831**	0.019	-0.022	0.121	0.041	0.155
CFF 19 Functionality problems with the system	-0.371	0.049	**0.834**	-0.018	0.022	0.124	0.059
CFF 9 Unclear concept	0.118	0.141	**0.734**	-0.003	0.053	-0.287	-0.13
CFF11 Too tight project schedule	0.202	0.003	**0.601**	0.324	0.208	-0.221	0.246
CFF 15 Lack of formal communication	0.206	-0.175	**0.581**	0.143	0.396	0.174	0.234
CFF18 Part-time dedication	0.386	-0.238	**0.548**	0.08	-0.157	0.08	-0.144
CFF 3 Poor project management effectiveness	0.143	-0.091	0.097	**0.903**	0.012	0.003	-0.139
CFF8 Poor knowledge transfer	0.13	-0.023	0.112	**0.777**	0.158	0.097	0.28
CFF 14 Poor quality of testing	0.073	-0.104	0.085	0.057	**0.867**	0.162	-0.181
CFF 12 Users' resistance to change	0.135	0.263	0.125	0.332	**0.462**	-0.233	0.38
CFF 13 Poor top management support	-0.035	0.165	0.34	-0.005	-0.143	**-0.762**	0.107
CFF 16 Software modification	0.295	0.263	0.267	0.045	0.015	**0.653**	0.01
CFF 20 Cost over runs	-0.038	0.037	0.039	-0.078	0.148	0.078	**-0.875**
CFF 17 Informal strategy	0.118	0.343	0.298	-0.441	0.191	0.2	**0.484**
Extraction Method: Principal Component Analysis.							
Rotation Method: Varimax with Kaiser Normalization.							
a. Rotation converged in 10 iterations.							

CFF*- Item related to Identification of Critical Failure Factors

Table 4: Interpretation of Output from the Exploratory Factor Analysis

Categorization in terms of Component for CFFs	TVE*	List of CFFs for Indian SMEs	RCMV**
Component 1 this component was named as Technology & Vendor related CFFs. it Consist following items:	15.088%	Poor consultant effectiveness	.828
		ERP Software misfit	.796
		Unrealistic expectations from top management concerning the ERP systems	.771
		Over-reliance on heavy customization	.668
Component 2 this component was named as Employee/Personnel/HR & Process related CFFs. it Consist following items:	14.344%	Poor quality of BPR	.874
		High turnover rate of project team members	.873
		Poor IT Infrastructure	.831
Component 3 This component was named as Performance related CFFs it Consist following items:	13.454%	Functionality problems with the system	.834
		Unclear concept of the nature and use of the ERP system from the users perspective	.734
		Too tight project schedule	.601
		Lack of formal communication	.581
		Part-time dedication	.548
Component 4 This component was named as Project related CFFs. it Consist following items:	10.127%	Poor project management effectiveness	.903
		Poor knowledge transfer	.777
Component 5 This component was named as Quality & End-user Related CFFs. it Consist following items:	.799%	Poor quality of testing	.867
		Users' resistance to change	.462
Component 6 This component was named as Enterprise related CFFs. it Consist following items:	7.690%	Poor top management support	(-.762)
		Software modification	.653
Component 7 This component was named as Strategy related CFFs. it Consist following items:	7.632 %	Cost over runs	(-.875)
		Informal strategy	.484

TVE*-Total Variance Explain, RCMV**-Rotated Component Matrix Value

Norms

The distribution of response over 50 Indian ERP consultants (respondents) from top 10 companies of IT (ERP) sector for each item on the Likert five point scales were analyzed, the mean value for each 20 items ranged from 4 to 5 with low SD difference. Based on the 50 respondents on Likert five point scales of agreement and disagreement, following norms are prepared to categories the mean range of the responses for each item.

Table 5: Descriptive Statistics for Identification of Critical Failure Factors (CFFs)
(Source: SPSS V 18.0)

Descriptive Statistics			
Critical Failure Factors	Mean	Std. Deviation	N
CFF 1 Poor consultant effectiveness	4.6	0.49487	50
CFF 2 Poor quality of BPR	4.48	0.50467	50
CFF 3 Poor project management effectiveness	4.54	0.50346	50
CFF 4 ERP Software misfit	4.56	0.50143	50
CFF 5 High turnover rate of project team members	4.46	0.50346	50
CFF 6 Over-reliance on heavy customization	4.56	0.50143	50
CFF 7 Poor IT Infrastructure	4.48	0.50467	50
CFF 8 Poor knowledge transfer	4.52	0.50467	50
CFF 9 Unclear Concept of the Nature and Use of the ERP system from the Users perspective	4.5	0.50508	50
CFF 10 Unrealistic expectations from top management concerning the ERP systems	4.62	0.49031	50
CFF 11 Too tight project schedule	4.6	0.49487	50
CFF 12 Users' resistance to change	4.6	0.49487	50
CFF 13 Poor top management support	4.62	0.49031	50
CFF 14 Poor quality of testing	4.68	0.47121	50
CFF 15 Lack of formal communication	4.56	0.50143	50
CFF 16 Software modification	4.6	0.49487	50
CFF 17 Informal strategy	4.42	0.49857	50
CFF 18 Part-time dedication	4.52	0.50467	50
CFF 19 Functionality problems with the system	4.6	0.49487	50
CFF 20 Cost over runs	4.5	0.50508	50

CFF*- Item related to Identification of Critical Failure Factors, Questionnaire One.

N*-Number of respondents in questionnaire

Table 6: Norms for Interpretation (Source: Author, MS Word)

Categorization of Mean Range to Explore the CFF for Indian SMEs	Mean Range
Survey Item is not CFF for the failure of ERP implementation at Indian SMEs	From 1 to Up to 2
Can't say that survey item is CFSF or not	From 2 to Up to 3
Survey item may be CFF for the failure of ERP implementation at Indian SMEs	From 3 to Up to 4
Survey Item is CFF for the failure of ERP implementation at Indian SMEs	From 4 to Up to 5

The mean and SD value of the 50 respondents from all over the India are given in the Table 5. Table 5 and Table 6 (Descriptive Statistics) of Survey Response from Questionnaire can be used as tentative norms.

Following seven dimensions can be used to interpret the response.

1. Technology & Vendor related CFFs.
2. Employee/Personnel/HR & Process related CFFs
3. Performance related CFFs
4. Project related CFFs.
5. Quality & End-user Related CFFs.
6. Enterprise related CFFs
7. Strategy related CFFs.

Uses

After completing and scoring all the survey items of instrument (questionnaire) ERP academicians and ERP practitioners can explore the CFFs that contribute in the failure of ERP implementation at Indian SMEs. 20 different aspects related to ERP implementation at Indian SMEs can be probed and one can work out strategy to reduce the probability of ERP implementation failure at Indian SMEs. On the basis of the results ERP consultants and academicians can develop an action plan for managing these CFFs efficiently and effectively.

"Identification of the Critical Failure Factors in the Failure of ERP Implementation at Indian SMEs"

Questionnaire No.___

Dear Consultants,

I am inviting you to participate in this research project to survey Indian ERP consultants/respondents and to find out what are the critical failure factors that may results in the failure of ERP implementation at Indian SMEs (Indian Small-Medium Size Enterprise). This questionnaire consists of twenty one questions that deal with identification of Critical Failure Factors (CFFs) for the failure of ERP implementation at Indian SMEs (Indian Small-Medium Size Enterprise).

Based on this survey I want to understand and introduce what can be the possible guidelines and strategies to avoid the failure of ERP implementation at Indian SMEs (Indian Small-Medium Size Enterprise). I have attached a short questionnaire about CFFs for the failure of ERP implementations at Indian SMEs (Indian Small-Medium Size Enterprise). The questionnaire is brief and will take about fifteen minutes to fill out. Guidelines for completing the questionnaire can be found on the form itself. Each questionnaire is numbered to help keep track of returns.

I promise that I will respect your privacy. I appreciate your valuable time and candor. I will make sure that your answers cannot be linked to you personally. Please be assured that all information you provide will be used for academic research only and your name or other identifying information will not appear on any part of the study report. All the individual responses will be kept confidential.

If you choose to participate in this survey please fill in your answers and send (or give) the questionnaire back to me. There are no risks to you or to your privacy if you decide to join this study by filling out this questionnaire. Participation in this study is voluntary. You can choose not to take part and you can also choose not to finish the questionnaire or omit any question you prefer not to answer without penalty or loss of benefits. Even if you decide not to participate that is fine. I will be very happy to share my results with you if you are interested.

If you have any questions about the survey, or about being in this study, you may contact me at @yahoo.com/@gmail.com. I hope you will view this as an important matter, and take some of your time to complete the questionnaire as your participation

represents a valuable contribution to this research project. Thank you in advance for your time and effort in completing the questionnaire. Your help is greatly appreciated.

General Information

ERP Consultant Name _____

Organization Name (ERP Vendor Name) _____

Nationality_____

Number of ERP Implementation in India_____

- (Please do select only one)

  Years in ERP_____ <1 , 1 to2, 2 to 3, 3 to 5, 5 to 10, 10+

- (Please do select ERP product of your expertise)

  ERP Product_____SAP/Oracle/Others

- (Please do select the Sector/Sectors for which ERP Implementation done by you)

  Implementation Area _____Manufacturing/Assembly Line/Service/Government

- (Please do type 1, 2, 3…etc for respective Sector/Sectors as applicable)

  Number of Project /Projects Implemented in Each Sector

  Manufacturing (_____), Assembly Line (____), Service (____), Government (____)

- (Please do type 1, 2, 3…etc for respective Sector/Sectors as applicable)

  Years of experience in each Sector/Sectors

  Manufacturing (_____), Assembly Line (____), Service (_____), Government (_____)

This Survey deals with Identification of Critical Failure Factors (CFFs) for the failure of ERP implementation at Indian SMEs (Indian Small-Medium Size Enterprise).

While Filling This Questionnaire Please Do Consider The Following Scenario:

Country	For India (Indian Environment only)
Industry	For Indian Small and Medium Size Enterprise (Please do not consider the Large Enterprise), Indian SMEs means as per the MSME Development Act, 2006.
Sector	For All(Manufacturing, Service, Assembly Line ,Government Etc)
Domain	For All (Finance, Marketing, HR, Production Etc)
ERP Vendor	For All(SAP, Oracle Etc)

Please do consider ERP project lifecycle start from

Planning > Implementation > Stabilization > Improvement

- **Planning**: Choosing the ERP package, scoping the project, formulating the system architecture, and approval of budget and schedule.
- **Implementation:** Configuring and implementing the ERP software.
- **Stabilization:** After initial implementation, a stabilization stage occurs when implementation problems are fixed and organizational performance improves.
- **Improvement**: Achieving the benefits, updating new modules, focusing on Continuous improvement and transformation.

CFFs: Critical Failure Factors define as the key aspects (areas) where "things must go wrong" in order for the ERP implementation process to achieve a high level of failure at Indian SMEs.

IIIA: In part IIIA, please identify the Critical Failure Factors (from question one to twenty) that are critical for all the phase of ERP implementation (Planning, Implementation, Stabilization, and Improvement) at Indian SMEs.

IIIB: In part IIIB please list any other critical failure factors which are missing in questionnaire but that may contribute in the failure of ERP implementation at Indian SMEs.

Please do select the number in the box which best represents your opinion for the Critical Failure Factors (CFFs) that results in the failure of ERP implementation at Indian SMEs (Indian Small-Medium Size Enterprise) on a scale of 1 to 5. (Please Select only One Box for each Question).

1 = Strongly Disagree; 2 = Disagree; 3 = Neutral; 4 = Agree; 5 = Strongly Agree

(IIIA).Please do read the following statements and tick(✓) in appropriate box to express your degree of agreement or disagreement regarding your views about Critical Failure Factors(CFFs) for the failure of ERP implementation at Indian SMEs Please do not omit any item.	Scale				
1. Inexperienced and ineffective consultants may results in the failure of ERP implementation at Indian SMEs.	1	2	3	4	5
2. Insufficient and poor quality of business process reengineering leads to the failure of ERP implementation at Indian SMEs.	1	2	3	4	5
3. Improper project management and mismanagement of resources may results in the failure of ERP implementation at Indian SMEs.	1	2	3	4	5
4. One of the reasons for the failure of ERP implementation at Indian SMEs may be the wrong selection of ERP vendor as it results in wrong ERP implementation and dissatisfaction.	1	2	3	4	5
5. High turnover rate of project team members results in the failure of ERP implementation at Indian SMEs because of the loss of trained resource.	1	2	3	4	5
6. Over realization on heavy customization increase the probability for the failure of ERP implementation at Indian SMEs due to the increase implementation complexity and cost.	1	2	3	4	5
7. Poor IT infrastructure can't give full benefits of ERP implementation at Indian SMEs.	1	2	3	4	5
8. Lack of knowledge transfer before and after ERP implementation at Indian SMEs leads to dissatisfaction among all parties.	1	2	3	4	5
9. Unclear concept of the nature and use of the ERP system among users of the Indian SMEs are the result of insufficient ERP education and the training	1	2	3	4	5
10. Unrealistic expectation of top management and enterprise from the ERP Implementation without considering complexity leads to dissatisfaction.	1	2	3	4	5
11. Too tight project schedules leads to the stress and poor quality of ERP implementation at Indian SMEs.	1	2	3	4	5
12. User's resistance to change can't help in successful ERP implementation at Indian SMEs.	1	2	3	4	5
13. Lack of top management support leads to many problems and ultimately in the failure of ERP implementation at Indian SMEs	1	2	3	4	5
14. Poor quality of testing not only waste time and money of the enterprise but also results in the failure of ERP implementation at Indian SMEs.	1	2	3	4	5

Please do select the number in the box which best represents your opinion for the Critical Failure Factors (CFFs) that results in the failure of ERP implementation at Indian SMEs (Indian Small-Medium Size Enterprise) on a scale of 1 to 5. (Please Select only One Box for each Question).

1 = Strongly Disagree; 2 = Disagree; 3 = Neutral; 4 = Agree; 5 = Strongly Agree

(IIIA).Please do read the following statements and tick(✓) in appropriate box to express your degree of agreement or disagreement regarding your views about Critical Failure Factors(CFFs) for the failure of ERP implementation at Indian SMEs Please do not omit any item.	Scale				
15. Lack of formal communication leads to misunderstanding and results in the failure of ERP implementation at Indian SMEs	1	2	3	4	5
16. Too much software modification increase complexity and failure risk along with the maintenance cost of the ERP implementation at Indian SMEs	1	2	3	4	5
17. Lack of formal strategy leads to uncertainty and confusion during and after the ERP implementation at Indian SMEs	1	2	3	4	5
18. ERP implementation at Indian SMEs may get fails due to part time dedication of team members and their less involvement.	1	2	3	4	5
19. Any ERP implementation can't be consider as successful if it doesn't provide the required functionally of the business (Indian SMEs).	1	2	3	4	5
20. High cost of ERP implementation considered as the failure of ERP implementation if it cross the budget of an enterprise (Indian SMEs).	1	2	3	4	5

"Others (please specify)" IIIB- Please do list any other Critical Failure Factors(CFFs) which are missing in above questionnaire but that may contribute in the failure of ERP implementation at Indian SMEs.

_____

_____

Thank you for your Cooperation!

Thank you for your participation. I appreciate your valuable time and candor.

I sincerely thank you for your valuable time and very useful information which will help me with a great deal. I assure you complete confidentiality of the information given by you.

Sincerely

Research Scholar

Nomenclature

CFFs	Item related to Identification of Critical Failure Factors, Questionnaire One.
ERP	Enterprise Resource Planning
N	Number of respondents in questionnaire
KCFFs	Item related to Key Critical Failure Factors.
RCMV	Rotated Component Matrix Value
SMEs	Small-Medium Size Enterprise
TVE	Total Variance Explained

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