

An Empirical Study on Critical Failure Factors and Business Intelligent System Failure at Pre-implementation Phase in Small and Medium Enterprises in Pakistan

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Abstract

Business Intelligence is one of best way to analyze the critical capabilities of organization, but the implementation phases of these competences are frequently overwhelmed with tribulations. That's why many projects of such capabilities fail, while others succeed. The basic purpose of this research is to identify the critical failure factors (CFF) in the pre implementation phase of Business Intelligent (BI) system and to test association between these critical factors. Small and Medium enterprises (SMEs) cannot be neglected in developing countries like Pakistan. They are chosen as target population because of its vital role in the development of economy such as creating employment opportunities, increasing GDP%, increasing the volume of export etc. Based on four hundred and fifty respondents, the barriers of cost are valuing among top five with highest value of mean which are additional cost associated with the managing BI, lack of financial resources, upfront cost, cost of obtaining BI software and setup cost respectively. This symbolizes the costing factor yet a foremost barrier in preponderance items in order to analyze BI in pre-implementation phase.

Keywords: Business Intelligence; Critical failure factor; Small and medium enterprises; Pre implementation phase

Introduction

The narration of successful business, in this industrialize uprising era is all about supervising, systemizing, measuring, monitoring and analyzing the transactional data with technology, proficiently and effectively. Undeniably, distinctiveness of contemporary organizations is the data revolution that has been steadily taking place over the last two decades. Many practitioners and scholars even see organizational and management decision making to be in the middle of a gradual transformation from an instinct- driven “art” to a progressively data-driven approach. Day to day massive amount of raw data is produced during every operational transaction in an organization [1]. BI converts information into knowledge with human judgment and intuitions. So we can say anecdotes of achievement now become yarn of managing intelligence [2].

According to “Howard Dresner” of Gartner research in 1989 BI is set of activities such as collecting, consolidating, organizing and presenting information in such approach which let the corporate world to craft the better business decisions toward their desired goals. BI is tool, technology or process within organizations ascertain thought provoking environment. BI makes the most of Business Processes and possessions in resourceful and proficient manner, improve the proactive decision making, curtail expenditure and capitalize the profit [3,4] placed BI in the top ten strategic technologies for 2014. These results are consistent with those of the last five years, which show that organizations are still struggling to make progress with BI for profitability and productivity [5,6].

The implementation of BI systems is colossal challenge. In business, it is allied not merely with advantages and benefits, but on the other hand, in some organization it also generates certain barricades, tribulations and risks. Not merely technology plays a vital part, but on top of all factors, such as community, processes, managing style and traditions of the organization, are also imperative. These factors

frequently symbolize a huge predicament and can disrupt or avert attempts and efforts of deployment of an effectual BI solution for operating task of organizations. These factors are acknowledged as critical factors. The current purpose of study is to recognize CFF in pre implementation phase of BI system.

Literature Review

According to [7] CFF are basically set of tasks when arise as a hindrance before or after the implementation of BI. Its implementation is not a simple and easier chore; instead it entails the complex infrastructure, long term appropriate resources and development of decades [8]. According to [9-14] technological barriers to BI adoptions are; lack of skills to implement BI/data warehouse, lack of technology (pre-BI infrastructure), data security concerns (pervasive BI and outsourced version), frequent data latency issues, BI project complexity, BI tools highly specialized for wide spread use, complexities of data management, fragmented data sources in the enterprise. From organizational perspective barrier to BI adoption are running cost, lack of executive board interest, no real or tangible benefits, poor return of investment, lack of knowledge about BI product, implementation time lags. From environmental perspective are insufficient government supports for BI initiatives, lack of a complete BI Suite offering by any vendor, typical BI systems not optimized for OLTP. According to [15] critical factor for BI failures are management issues, changing

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requirements and objectives, Justification and budget, organization and staffing, user issues, collaborative work problems, project planning and scheduling, data warehouse standards, tools and vendors, security, data quality, integration, data warehouse architecture, and performance.

According to [16] two manager aspect management and technology are found to be indispensable impediments in the BI system failure. They embrace top management support, change management, clear vision and mission, organizational culture, data information accuracy, sustainable data quality, suitability of hardware and system reliability.

Moreover, in literature reviews CFF are not only of technical or managerial nature but social factors also play vital part in this domain. Software and system of any organization comprises of three fundamentals elements which makes possible the successful running of project. These are people, technology and processes toward the implementation of different kind of strategies in organization: In corporate tactics management try to make alignment between BI system and organizational process to increase the effectiveness of business decision making, growth and development whereas in technology perspective strategies updation of technology, software's and advancement is integrated parallel.

Marie Barry [17] investigate the main areas of risk are scope creep, uncontrolled finances, Poor Communication, stake holder non-involvement, skills shortage, unavailability of tools and technology, uncontrolled quality of deliverables, poor, wrong or no leader, technical difficulties, legal difficulties [18-26]. Identified common mistakes in implementing BI systems are; using ad hoc practices to select and fund BI project, providing inadequate governance to BI program management, establishing de facto program governance based on the initial BI projects, failing to strategically position BI in business organization, not providing adequate resources and funding needed for successful BI initiative.

Research Problem

Utters that organization do not demonstrate the failure of BI system execution. Nonetheless, BI failure rate is awfully high due to its complex structure [27]. This research paper is to find out the barriers of BI pre-implementation system in Pakistan. To make certain objectives of research being attained; the objectives were devised as follows:

1. Identify the BI adoption level in Pakistan.
2. To identify the significant BI CFF in SMEs Pakistan.
3. To analyze the association between failure of pre-implementation phase of BI and its CFF in SMEs Pakistan.

Research Questions

The following research questions were devised for which research study has been conducted.

1. What is the BI adoption level in Pakistan?
2. What are significant BI CFF in pre implementation phase in SMEs Pakistan.
3. Is there is any association between failure of pre-implementation phase of BI and its failure factor in SMEs Pakistan.

Research Framework

Figure 1 shows Framework of BI barriers in Pre-Implementation of BI system Failu Hypothesis Formulation.

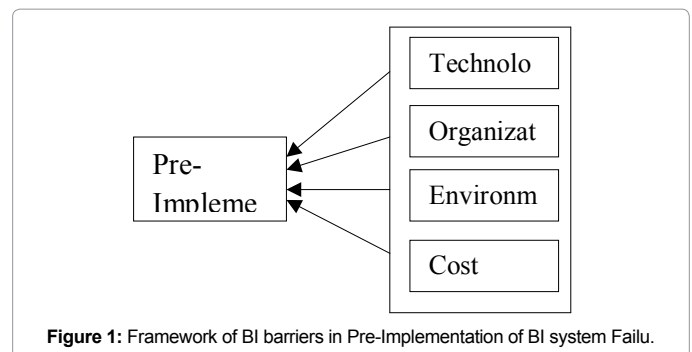


Figure 1: Framework of BI barriers in Pre-Implementation of BI system Failu.

Category	# Barriers
Technological Barriers	6
Organizational Barriers	9
Environmental Barriers	3
Financial Barriers	6
Total	24

Table 1: Summary of BI Barriers based on Categories.

Sr #	Category	Factors
1	Cost Factor	CF1:UpfrontCost
2		CF2: Setup Cost
3		CF3: Cost of Obtaining BI Software
4		CF4:AdditionalCostassociatedwithmanagingBI
5		CF5: Lack of Financial resource
6		CF6:Cost required to support management and training
7	Organizational Factor	OF1:Lack of executive board interest
8		OF2: Lack of Knowledge about BI product
9		OF3:Lack of user oriented change management
10		OF4:Lack of Business centric championship
11		OF5:Lack of Business vision and Planning
12		OF6:Organizational resistance
13		OF7: Inadequate governance for BI program
14		OF8: Poor Business and BI alignment
15		OF9: Incomplete Business requirements
16	Technological Factors	TF1:Lack of Skill to handle BI program
17		TF2:Lack of technology
18		TF3:Data Security Concerns
19		TF4:Poor Data Quality
20		TF5:BI Software complexity
21		TF6:Complexity of Data Management
22	Environment Factor	EF1:Insufficient Government support for BI initiatives
23		EF2:Lack of user adoption
24		EF3:Lack of interest from user solution

Table 2: Detail of Factors for Research.

Hypothesis Formulation

H0: There is no significant relationship between failure of BI system in pre implementation phase and critical failure factors.

H1: There is significant relationship between failure of BI system in pre implementation phase and critical failure factors.

Research Methodology

The research employs quantitative techniques to scrutinize the critical failure factors. SPSS is used for the empirical analysis through regression and Factor analysis [28-32]. Random sampling Techniques is used to collect the Data through questionnaire. Four hundred and fifty respondents participate in this research. The questionnaire is designed to collect information pertaining to demographic of respondents and company, BI adoption level, barriers to BI adoption [33-38] (Tables 1 and 2).

Reliability test

For consistency of BI barriers, a reliability test is demeanor to identify the Cronbach's alpha value. Value of Cronbach's alpha is 0.661 which is not acceptable [39-43]. A comprehensive analysis was conducted to perk up the Cronbach's alpha value. The decision to remove some factors is made from the table Cronbach's alpha value if the item has deleted [44-48].

Cronbach's alpha value after extended research

By removing 8 factors related to organizational and environment factor including OF1:Lack of executive board interest, OF2: Lack of Knowledge about BI product, OF3:Lack of user oriented change management, OF4:Lack of Business centric championship, OF5:Lack of Business vision and Planning, OF6:Organizational resistance, OF7: Inadequate governance for BI program, EF1:Insufficient Government support for BI initiatives, EF3: Lack of interest from user solution from reliability analysis, the value of Cronbach's alpha for barriers increased to 0.707. Value is acceptable for further research and testing [49-53].

Descriptive analysis

A descriptive analysis was applied to portray the demographic of participants. The demonstration of the basic demographic characteristics includes gender, age, position and company industry [54-58].

Demographic Profile

Pie charts (Figures 2 and 3) demonstrate that collected sampling consists of 64.44% (288 participants) male and 35.56% (162 participants) female where mass participants were in the slot of 21-30 which consisted 42.67% (192 participants) [59-63]. There were 31.78%

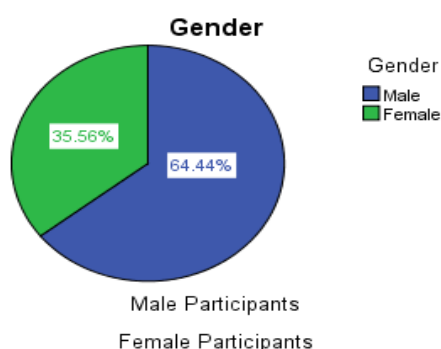


Figure 2: Pie chart demonstrate the collected.

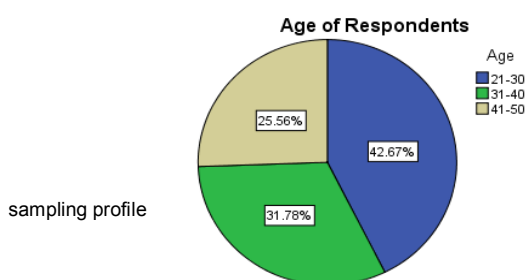


Figure 3: Pie chart demonstrate the collected.

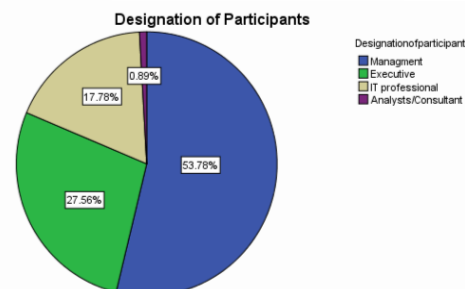


Figure 4: Pie chart presents categorization of employees.

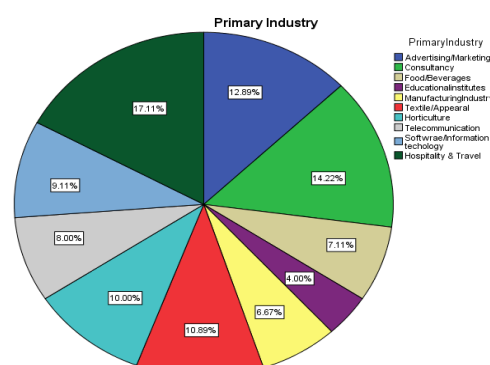


Figure 5: Different natures of organization's percentage are presented in pie chart.

(143 participants) resides into category of age from 31-40 and 25.56% (115 participants) in age group of 41-50.

Pie chart (Figure 4) presents categorization of employees. Who works under the designation of business management or middle management in an organization consists of 53.87% (242 participants) and subsequently executive staff includes 22.1% (124 participants) [64-70]. Afterward the position of IT Professionals were containing 17.78% (80 Participants), 0.89% (40 participants) respectively.

Different natures of organization's percentage are presented in pie chart (Figure 5). Among all 12.89% data of respondents has been gathered from advertising/marketing industry, 4.225 from consultancy field, where as 7.11% data was assembled from food and beverages industry [71-75]. 4.00% of the respondents data was from Manufacturing industry, 6.67% from education and institutions, 10.89% from the Textile/Apparels, 10.00% from Horticulture, 8% from the telecommunication franchises sector, 9.11% from were serviced in information technology and 17.11% are listed in hospitality and travel sector [75-80].

Means and standard deviation

The mean and standard deviation for twenty four BI barriers describe in Table 3 were chosen to categorize the important barriers by measure up to the mean value. The highest value of mean demonstrate the vital barrier where the lowest value of mean shows the non-important barriers of BI during pre-implementation phase of BI system [81,82].

Based on four hundred and fifty respondents, the barriers of cost are valuing among top five with highest value of mean which

BI Barriers	N	Mean	Std. Deviation
CF4:AdditionalCostassociatedwithmanagingBI	450	3.7756	1.01034
CF5:LackofFinancialresource	450	3.7533	2.62489
CF1:UpfrontCost	450	3.7200	1.47490
CF3:CostofObtainingBISoftware	450	3.6889	.99715
CF2:SetupCost	450	3.3533	1.23319
TF1:LackofSkilltohandleBIprogram	450	3.3089	1.46683
CF6:Costrequiredtosupportmanagementandtraining	450	3.2333	1.30145
TF5:BISoftwarecomplexity	450	3.1733	1.33355
OF9:IncompleteBusinessrequirements	450	2.9400	1.41373
OF8:PoorBusinessandBIalignment	450	2.9200	1.37032
TF3:DataSecurityConcerns	450	2.8911	1.36751
TF2:Lackoftechnology	450	2.8556	1.44968
TF4:PoorDataQuality	450	2.8000	1.45305
TF6:ComplexityofDataManagement	450	2.7867	1.58608
OF3:Lackofuserorientedchangemanagement	450	2.2378	1.60980
EF2:Lackofuseradoption	450	1.4600	1.07800
Valid N (listwise)	450		

Table 3: Describe the mean and standard deviation for twenty four BI barriers.

	Category	BI Barriers
1	Technological Factor	TF1:Lack of Skill to handle BI program
		TF2:Lack of technology
		TF3:Data Security Concerns
		TF4:Complexity of Data Management
		TF5:BI Software complexity
		TF6:Poor Data Quality
2	Cost Factor	CF1:Upfront Cost
		CF2:Setup Cost,
		CF3:Cost of Obtaining BI Software Additional
		CF4:Cost associated with managing BI
		CF5:Lack of Financial resource
		CF6:Cost required to support management and training
3	Organizational Factor	OF9:Poor Business and BI alignment
		OF10:Lack of user oriented change management
		OF3:Incomplete Business requirements
4	Environmental Factor	EF2:Lack of User adoption

Table 4: Represents various Categories of BI Barriers.

are Additional cost associated with the managing BI, Lack of financial resources, Upfront cost, Cost of obtaining BI software and Setup cost respectively [83]. This symbolizes the costing factor yet a foremost barrier in preponderance items in order to analyze BI in pre implementation phase.

Factor component analysis

KMO and bartlett's test: Value of KMO is 0.754 it represent the sampling adequacy is at satisfactory level. Bartlett's test of sphericity is significant with the value of 0.000. It is small enough to reject the null hypothesis. This means that correspondence matrix is not an identity matrix [84].

Principle component analysis:

Total variance explained: The Table 1, Appendix shows all the factors involved in research study extractable from the scrutiny along with their eigenvalues, In this analysis, there are four factors with eigenvalues higher than 1. The "percentage of variance" values enlighten

that how much of the total variability can be calculated by each of these abstract factors. Factor 1 report for 21.275% of the variability in all 16 variables, factor 2 accounts for 10.467% of the variability in all and so on. All the remaining factors are not significant. Cumulative percent column accounts for 47.117% variability among all 16 variables.

Component matrix: The Table 2, Appendix demonstrates the loadings of the sixteen factors into four factors. The slit on the table symbolize loadings that have value less than 0.5. We covered up all loadings less than value of 0.5.

Regression analysis

Regression analysis conducted to identify the association/relationship between sixteen barriers extracted through factor analysis. Sixteen barriers are categorized into four major factors which are further used as independent variables to predict failure of BI system as the solely dependent variable [71] (Table 4).

Regression analysis on critical technological barriers against failure of BI system: Based on regression result in (Table 3, Appendix), the P-value in ANOVA is 0.001 which is less than 0.05. Therefore, there is significant relationship between critical technological barriers and BI System failure.

R square (R^2) is interpreted as the correlation coefficient squared and also said to be coefficient of determination. There is 2% of total of Y (failure of BI pre implementation phase) explained by the regression model consisting six technological barrier mentioned in Table 4.

Regression analysis on critical costing barriers against failure of BI system: Based on regression result represented in Table 4, Appendix, the P-value in ANOVA is 0.000 which is less than 0.05. Therefore, there is significant relationship between critical cost barriers and BI System failure.

R square (R^2) value represents there is 4% of total of Y (failure of BI pre implementation phase) explained by the regression model consisting six costing barriers mentioned in Table 4.

Regression analysis on critical environmental barriers against failure of BI system: Based on regression result represented in Table 5, Appendix, the P-value in ANOVA is 0.266 which is greater than 0.05. Therefore, there is no significant relationship between critical environmental barriers and BI System failure. R square (R^2) is interpreted as there is 0.3% of total of Y (failure of BI pre implementation phase) explained by the regression model consisting one environmental barrier mentioned in Table 4.

Regression analysis on critical organizational barriers against failure of BI system: Based on regression result represented in Table 6, Appendix the P-value in ANOVA is 0.000 which is less than 0.05. Therefore, there is significant relationship between critical environmental barriers and BI System failure.

R square (R^2) is interpreted as there is 3% of total of Y (failure of BI pre implementation phase) explained by the regression model consisting three organizational barriers mentioned in Table 4.

Overall significance of the model: In the model summary Table 7, Appendix, facilitates to measure about the fitness of the model. Value of R-squared varies between 0 and 1. In this case it is 0.136, so 13% of the variance in failure of BI system at pre-implementation phase can be explained by organizational factors, environmental factors, costing factors and technological Factors. The column standard error of the estimate helps to measure of how much R is predicted to vary from

one sample to the next. Here the value of standard error of estimate is 1.19557.

Based on regression result represents the P-value in ANOVA is 0.000, 0.000 and 0.001 for technological, cost and organizational barriers which is less than 0.05. Therefore, there is significant relationship between critical barriers and BI System failure.

Whereas P value of environmental barriers is 0.328 which is higher than 0.05. It represents that there is no significance relationship between the environmental barriers and failure of BI system.

In coefficient table summary size of the coefficient for each independent variable measure the intensity of the outcome that variable is having on the dependent variable along with the directions. First coefficient of cost factor demonstrating that [80]. 552 of the failure of BI system variable is expected to increase when that cost barriers variable increases by one, holding all other variables (environmental, technological and organizational) constant. Second coefficient of technological factor demonstrating that -.319 of the Failure of BI system variable is expected to decrease when that technological barriers variable increases by one, holding all other variables (environmental, cost and organizational) constant. Third coefficient of environmental factor demonstrating that 0.051 of the failure of BI system variable is expected to increase when that environmental barriers variable increases by one, holding all other variables (cost, technological and organizational) constant. Fourth coefficient of cost factor demonstrating that -.210 of the failure of BI system variable is expected to decrease when that organizational barriers variable increases by one, holding all other variables (environmental, technological and cost) constant.

Tools and software other than BI

Pie charts in Figure 6 characterize what kind of technology organization adopted other than BI. The collected sampling consists of 40.67% who adopted Microsoft Access for data base management and business operations [75]. 17.33% using Microsoft excel, 16.22% using database management system, 15.11% using homegrown systems and software according to their feasibility.

Findings and Conclusion

Research study prevail the BI adoption level in Pakistan. Only 2 percent organizations of SMEs using BI system for their decision making others are using different kind of tools for the effective management. So it clearly identifies the usage of BI system. This has

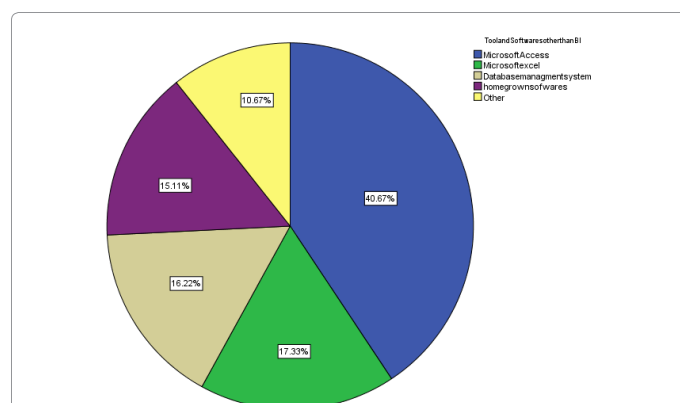


Figure 6: Pie charts characterize what kind of technology organization adopted other than BI.

answered the research question one 'What are the adoption levels in SMEs of Pakistan? In further study some significance barriers identify essentially impacting the corporate decision to adopt BI modules. Through reliability analysis some factors were removed and to check the significance of remaining factors, Factor component analysis testing were performed.

By evaluating the result between descriptive and regression, four hundred and fifty respondents, the barriers of cost are valuing among top five with highest value of mean which are Additional cost associated with the managing BI, Lack of financial resources, Upfront cost, Cost of obtaining BI software and Setup cost respectively. This symbolizes the costing factor yet a foremost barrier in preponderance items in order to analyze BI in pre implementation phase.

The three top lowest mean scores which less agreed by respondents are Poor Data Quality, Complexity of Data management, Lack of Business Vision and Planning. Their mean scoring are from range 2.76 to 1.46 which is close to neutral score. This helps to explain the most significance factors as a critical barrier toward the implementation of BI in the pre-implementation Phase.

Through regression analysis among the four critical barriers categorized as Organizational Barriers, Technological barriers, Cost barriers and environmental barriers three barriers are associated with Failure of BI system. On the other hand environmental barriers are insignificant with the failure of BI system.

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