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RESEARCH ARTICLE

Business intelligence solution implementation challenges: A comparative analysis of service based start-ups, small & medium and large enterprises

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ABSTRACT

The term Business Intelligence (BI), first used in 1989 to describe an umbrella concept by Howard Dressner involving methods for improving business decision-making based on facts. It gradually evolved into data-driven decision support systems (DSS) in the contemporary era of technology, replacing terms like executive information systems. BI Solution works as a combination system of collection and storage of data to generate 'actionable information and knowledge at the right time, in the right location, and in the right form. Currently, BI solutions act as a priority for chief information officers (CIO), as a Gartner survey reported, to enhance business effectiveness and innovation by generating quality information of the company and using it in the decision-making process. Over the last few decades, business data volumes have increased tremendously due to the rise of business information systems such as ERP, CRM, etc. International Data Corporation (IDC) highlighted in the 6th annual study that the digital universe comprising structured and unstructured data will grow 300 times to 40,000 exabytes from 130 exabytes by 2020. The size of data will double every two years from 2012 onwards. India has witnessed the increased implementation of business intelligence solutions in the past decade, especially in the service industry, comprising retail, healthcare, BFSI, and IT organizations, to enhance their business practices & procedures and achieve competitive advantage. The present research aims to do a comparative study of business intelligence solution implementation challenges among service industry start-ups, small & medium, and large enterprises.

Keywords: sustainable growth; business intelligence solution implementation in start-ups; BIS implementation challenges in small; medium and large enterprises; BIS implementation in service industry

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1. Introduction

BI solutions deliver organizations the capabilities of 'BI infrastructure, metadata management, development tools, collaboration, reporting, dashboards, ad-hoc queries, integration with legacy systems, searching tools, Mobile BI, OLAP, interactive visualization, predictive modeling, data mining and scorecards' to manage, analyze and discover knowledge[1,2].

The procedures, equipment, and software used to gather, combine, process, evaluate, and display corporate data are together referred to as business intelligence (BI). Better corporate decision-making is the main goal of business intelligence. To assist companies in making more data-driven choices, it incorporates the use of best practices, data analytics, data mining, and data visualization. Firm's need considerable human and financial resources to address the BI solution's implementation challenges and ensure implementation success. Therefore, hesitate to adopt the solutions considering the limited returns against the risks involved. Besides, the organization perceives the little customization opportunity of the products are incapable of meeting the dynamic market demands and hence involves greater complexity in implementing BI solutions. Irrespective of these hesitations among the service organizations, the service industry has shown substantial preference in applying BI solutions, namely, the data warehouse (36%), OLAP & associated reporting tools (34%), ETL tools (18%), and predictive analytics (12%)[3,4]. Business intelligence (BI) offers insights that facilitate improved resource management, waste reduction, and operational efficiency, all of which assist firms achieve sustainable growth. BI tools assist businesses in making choices that meet sustainability objectives and provide long-term economic advantages by accessing data on environmental effect[5]. The use of business intelligence (BI) varies greatly depending on the size of the organization; in general, bigger companies have more resources and are less risk-averse than smaller companies[6]. The adoption of business intelligence (BI) presents special obstacles for small and micro-sized firms (SMEs) because of their limited resources, perceived risks, and financial restrictions[7]. Therefore, it's essential to lower the cost and increase the accessibility of BI solutions so that these smaller businesses can successfully use data[8].

The service industry contributed around 55.39% to India's entire GDP in 2019-2020. With a minor increment in 2021, the service industry accounts for approximately 55.47% of the Indian GDP, which amounts to around 183.43 lakh crore Indian rupees[9]. The service sector accounts for more than half of the entire Gross Domestic Product (GDP) in India every year[10]. The service sector is further divided into multiple sub-sectors such as IT & ITeS, tourism & hospitality, banking & financial services, healthcare, retail & ecommerce, etc.[11]. The Government of India has recognized the importance of promoting growth within the service sector by providing incentives to businesses[12]. Gartner forecasted that the contribution of the significant sub-service industries, e.g., information technology, banking financial service & insurance (BFSI), retail & ecommerce and healthcare industry is likely to increase in next decade[13]. Gartner confirmed in a press release that spending within information technology in India is expected to grow by 6% in 2021, with a valuation of 81.9 billion dollars[14]. The service industry is dominated by the four sub-industries considered in this research. Integrating the Business Intelligence (BI) solution with the service industries is optimal because of its latest technologies adaption capability and the vision of being a leader in the world economy[12,15,16]. The researcher has considered four industries in this research:

- Information technology & information technology enabled services (IT & ITeS)
- Banking financial services and insurance (BFSI)
- Retail and ecommerce
- Healthcare

2. Business intelligence solution implementation

The companies that have invested in CRM technologies and are not realizing full benefit from the same are likely to miss a critical piece of the solution, which is the business intelligence process that drives behavioral change[17]. Due to the increase in several business decisions, complexity and customers demanding a higher level of services results in multiple technical and business challenges for the enterprise[18]. The author highlighted that the BI tool plays a critical role in the organization's comprehensive CRM strategy[19]. With the BI enablement in the CRM, the enterprise can best manage customer relationships for maximum customer satisfaction, loyalty, retention, and profitability[20,21].

In this era of big data and intelligent machines, the service industry is applying BI and its various tools to serve customers efficiently after growing to a certain extent, to focus on reaching the global markets, albeit to a limited scale[22,23]. However, services firms are deficient in incurring precise business-related information to utilize their BI solutions and make effective business decisions[24,25]. The industry-wide Big Data Warehouse (BDW) involves internal sources (individual data warehouse) and external sources, enabling its organizations to develop the appropriate business analytical tools[26,27].

The thirteen BI solution implementation challenges identified by a literature review which are included in the questionnaire as a research variable, e.g., committed management support and sponsorship, a clear vision & well-established use case, implementation time, sound implementation methodology, technology fit, flexibility of customization, availability of adequate resources in the organization, balanced and skilled project team, organization change management process, integration capability, user involvement, technical factors, and BIS scalability[24,25,28-36].

3. Research objective

The research objective is to understand the business intelligence solution (BIS) implementation challenges in the service industry. The researcher has done an in-depth review of the existing pieces of literature focusing on the business intelligence (BI) solution implementation[20]. These challenges have been incorporated in the questionnaire and rated by the respondents on the seven-point likert scale. The critical parameters of the current research sample are as follows:

- Industry: business-to-business (B2B) service industry, e.g., IT & ITeS, BFSI, retail & ecommerce and healthcare
- Geography: India
- Target respondents' designation: CxOs & strategic leaders
- Sampling: stratified random sampling
- Sample size: 342 respondents

Table 1. Research question and analysis tools.

Research Question	Analysis
What are the implementation challenges of the BI solution in the service industry?	Analysis Using IBM® SPSS® Software Frequency Mean
Do the BIS implementation challenges differ in startups, SMEs, and Large Enterprises?	Standard Deviation Post-hoc LSD One Way ANOVA

4. Methdology

The present investigation utilizes a quantitative research approach to examine the obstacles encountered during the deployment of business intelligence systems (BIS) in various service sector firms[37]. In order to identify and analyze these problems across start-ups, small and medium-sized firms (SMEs), and big organizations, the study focuses on collecting and evaluating descriptive data[38]. 342 respondents from a variety of service industry sub-sectors, including banking financial service & insurance (BFSI), IT & ITeS, healthcare, and retail & ecommerce, were given a structured survey to complete in order to gather the data. The chosen respondents provide a thorough summary of the difficulties encountered in implementing BIS in various organizational sizes and industries[39].

5. Synthesis and analysis

Table 2 shows the profile of 342 respondents; 83.6% of respondents are male and 16.4% females. 4.1% of the employees are at executional (operational level), and another 21.3% the engaged in the responsibility of mid-Level operations. 74.6% of the remaining respondents are at senior-level or strategic-level responsibility areas

Table 2. Respondent's profile.

Aspects	Frequency	Percent	Valid Percent	Cumulative Percent
Gender				
Female	56	16.4	16.4	16.4
Male	286	83.6	83.6	100
Key Responsibility Area (KRA)				
Operational Level	14	4.1	4.1	4.1
Tactic Level	73	21.3	21.3	25.4
Strategic Level	255	74.6	74.6	100.0
Company Size				
Start-up	49	14.3	14.3	14.3
Small & Medium Industry	179	52.3	52.3	66.7
Large Enterprise	114	33.3	33.3	100.0

Source: *Data extracted by the author*

The respondents are from four service industry sub-sectors, including banking financial service & insurance (BFSI), IT & ITeS, healthcare, retail & ecommerce[40] out of which 52.3% of respondents are from small & medium enterprise (SME), followed by 33.3% from large enterprises. There are only 14.3% of respondents have categorized themselves as a start-up.

Table 3. Bis implementation challenges in the service industry.

Implementation Challenges	Mean	Std. Deviation
Balanced and Skilled Project Team	5.9561	1.24239
Technical Factors	5.8889	1.24879
BIS Scalability	5.8830	1.20278
Committed Management Support & Sponsorship	5.7105	1.36820
Flexibility of Customisation	5.7047	1.55747

Implementation Challenges	Mean	Std. Deviation
Organisation Change Management Process	5.6901	1.55179
A Clear Vision & Well-established Use Case	5.6871	1.35656
Sound Implementation Methodology	5.6316	1.40128
User Involvement - During Implementation	5.5906	1.46982
Availability of Adequate Resources in the Organisation	5.5702	1.68990
Integration Capability	5.5351	1.54415
Technology Fit	5.5205	1.71020
Implementation Time	5.4795	1.64018

Table 3. *(Continued)*

Source: *Data extracted by the author*

The goodness of descriptive statistics used in this study lies in their ability to simplify complex data, reveal underlying patterns, provide a basis for more advanced analysis, and support informed decision-making. The implementation challenge of BI solution is estimated in **Table 3**. The balanced and skilled project team has a mean value of 5.9561. It indicates that most organizations that face challenges in BIS solution implementation do not have a balanced and skilled project team[41]. It is essential to have a balanced team to acquire the proper skill set so that BIS can be used for the appropriate purpose, or else there will be an issue with its incorporation[42]. Similarly, BIS scalability poses a challenge in BIS implementation with a mean value of 5.8830. It indicates that the second most challenging factor does not have the technical expertise and lacking the infrastructure to support the BIS framework within a service-based organization[43]. It is imperative to have a skilled team, or else the implementation process of BIS gets difficult.

Similarly, **table 4** shows a company category-wise comparison to understand the compression among the implementation challenges in BIS implementation. The data shows that for a start-up, the committed management support and sponsorship have a mean value of 1.56682, which is more than the small industries industry. In a small and medium industry, the mean value is 1.27557, and the SD value is 0.09534. The statistical analysis shows that the start-up, SME, and large enterprises have different perceived implementation challenges[44]. The table shows that the implementation challenges of the technology fitment and integration capability have a significant difference for group three, which is small & medium industry (SME) and large enterprises[45].

Table 4. Bis implementation challenges among start-ups, small & medium and large enterprises.

BIS Implementation Challenges	Start-up		Small & Medium Industry		Large Enterprise		F Value[A]	Sig. Groups[B]
	Mean	SD	Mean	SD	Mean	SD		
Committed Management Support and Sponsorship	1.56682	.22383	1.27557	.09534	1.40852	.13192	1.798NS	
A Clear Vision & Well-established Use Case	1.36900	.19557	1.40792	.10523	1.26935	.11889	.720 NS	
Implementation Time	1.70558	.24365	1.63552	.12224	1.61809	.15155	1.065NS	
Sound Implementation Methodology	1.33853	.19122	1.38241	.10333	1.46649	.13735	.100 NS	
Technology Fit	1.72640	.24663	1.77958	.13301	1.55320	.14547	3.112*	3
Flexibility of Customisation	1.61045	.23006	1.63900	.12250	1.39887	.13102	.698 NS	

Availability of Adequate Resources in the Organisation	1.70558	.24365	1.66430	.12440	1.73586	.16258	.114NS	
Balanced and Skilled Project Team	1.06066	.15152	1.24791	.09327	1.30731	.12244	.654 NS	
Organisation Change Management Process	1.35401	.19343	1.66718	.12461	1.40940	.13200	2.92 NS	
Integration Capability	1.62516	.23217	1.55186	.11599	1.40344	.13144	7.639**	3
User Involvement - During Implementation	1.54469	.22067	1.44664	.10813	1.47977	.13859	.509NS	
Technical Factors	1.48146	.21164	1.15947	.08666	1.28494	.12035	.180 NS	
BIS Scalability	1.26505	.18072	1.24105	.09276	1.11294	.10424	.823NS	

A- NS-Not Significant **-Significant at .01 *-Significant at .05

B- Group 1 – Start-ups and Small & Medium Enterprises, Group 2 – Start-ups and Large Enterprises, Group 3 – Small & Medium Enterprises and Large Enterprises

Table 4. *(Continued)*

Source: *Data extracted by the author*

6. Conclusion

The data suggests that the top 3 perceived implementation challenges are the balanced & skilled project team, technical factors, and scalability of business solutions[46]. On the contrary, Integration capability and implementation time are the least rated challenges, which do not significantly impact the organization's BIS processes[47]. The larger organizations have rated implementation challenges as implementation time, methodology, technology fitment, customization flexibility, organization change management process, user involvement, and BIS scalability[48]. This finding suggests that larger organizations prioritize implementing the BIS by strictly adhering to the time[49].

7. Research implications

Theoretical implications: the literature review aimed to critically assess how BIS is used in the service industry and analyze the thirteen most common challenges organizations face while implementing the business intelligence frameworks[50].The literature review of the present study suggested that the most common implementation challenges faced by organizations about business intelligence IT Solutions include maintaining a balanced and skilled project team, user involvement, collaborative decision making, poor technical abilities, scalability, limited resources, and a flawed organizational change management process[51].

Managerial implications: this study contributed to the literature by examining a comparative study of business intelligence solution implementation challenges in the service industry[52].The finding will help the organization identify the BI solution implementation challenges and their impact on different organizational processes. Organizations can address the specific challenges across the functional areas to effectively integrate business intelligence solutions without encountering hazardous challenges[2]. The perceived implementation challenges in startups, SMEs, and large enterprises are not similar[53]. Hence, if the decision-makers work specifically on respective challenges, they would eliminate the challenges in less time and resources[54].

8. Future scope of the research

The limitation of this study is that it has followed a cross-sectional design. The research can be replicated to the same audience with a longitudinal research approach in the future[55]. Only the service

industry has been considered for analysis[56]. Different industries or combinations of two or more industries could have been taken to provide a more generalized viewpoint and reflect upon well-articulated findings[57]. Also, the present research considers only India-based service industry for the data collection, which can be considered the study's limitation. In future research, the study can be extended to other geographies[58].

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Author contributions: For research articles with several authors, a short paragraph specifying their individual contributions must be provided. The following statements should be used "Conceptualization, AT and RB; methodology, SKV; software, ARS; validation, RH, ARS and AT; formal analysis, SKV; investigation, ARS; resources, ARS; data curation, RH; writing—original draft preparation, SKV; writing—review and editing, RH; visualization, RB; supervision, ARS; project administration, AT; funding acquisition, ARS & RH. All authors have read and agreed to the published version of the manuscript." Please turn to the CRediT taxonomy for the term explanation. Authorship must be limited to those who have contributed substantially to the work reported.

Conflict of interest

The authors declare no conflict of interest.

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