A Proposed Framework for the Implementation of a Business Intelligence System

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Article Info	Abstract
	A lot of focus can be attributed to the rising importance of Business Intelligence Systems (BIS), which have been viewed as a broad category of technologies, applications, and processes for analyzing data to help its users make better decisions. Although Business Intelligence (BI) can help improve a company's performance, many companies often fail to realize the expected benefits of BI, and these projects are considered failures in themselves. Hence, it is essential to consider Critical Success Factors (CSFs) to obtain a successful implementation. However, very few existing research papers have associated CSFs with the various implementation stages and roles. This research study aims to design a framework that will embed various CSFs for BIS, categorized by the different stages, categories, priorities, and roles involved. Following the evaluation process, the study's main results show that the proposed framework was beneficial for BI implementation as there was no such framework that interconnects multiple components such as CSFs, implementation stages, categorization of CSFs, prioritization of CSFs and implementation roles.

I. INTRODUCTION

Strategically and operational-wise, many organizations are adopting a BI (Business Intelligence) system that would help them use the information to make smarter decisions [1]. BIS (Business Intelligence System) uses operational data and with the help of analytical tools, this complex and competitive information is being represented to organizations to make better decisions [2]. However, developing a BIS is a complex process as it requires many resource processes. Hence, it is essential to consider CSFs (Critical Success Factors) to obtain a successful implementation [3].

However, limited research identifies the CSFs associated with BIS and categorizes them at the implementation stages. The main aim of this research study is to develop a better understanding and usage of the CSFs for implementing BIS by focusing on its project life cycle. This study will address the gaps identified from the Systematic Literature Review (SLR) as it has been found that very few existing frameworks relate their CSFs and the implementation stages involved and none of the existing frameworks involved the implementation roles nor the prioritization of CSFs. Hence, findings from the SLR show that the areas have not matured. Therefore, the aim of this study will be to propose a framework comprising CSFs that will serve as a guide for all the entities involved in the implementation of a BIS.

The research questions for the paper were set as follows:

RQ1: What are the implications of implementing a framework for BIS?

RQ2: How can a framework consisting of CSFs, implementation stages, roles, and priority help in the implementation of a BIS?

RQ3: What can be deduced regarding the effectiveness, impact, and structure of the proposed BI Framework which consists of CSFs, implementation stages, roles, and CSF priority?

The innovative aspect of this research study is to develop a framework for BI implementation, which will combine and interlink all the following major components, namely CSFs, implementation stages, CSF's main categories, CSF priorities and implementation roles.

The remaining sections of this paper have been organized as follows. Section II presents the related works to our study. Section III presents the methodology, while Section IV presents the development of the proposed framework. Section V illustrates the proposed framework and Section VI concludes the paper.

II. RELATED WORKS

For this research study, publications within the last four years were considered; from 2018 to 2022. Insights from the final selected list of 40 research papers were analyzed using a Systematic Literature Review (SLR) [4]. This section reports only the main findings obtained from the SLR and responds to **RQ1**.

A. BI Implementation Stages

All the stages in the implementation process are very important as BI is a combination of tasks that involves the collection, storage, and analysis of data from business processes to help to make better decision-making [5]. Most

of the papers studied have the same flow of stages, starting from the identification of the business needs and problems and ending with the training of the end-users [3], [5] - [13]. However, not much emphasis was given to the identification of the objectives and goals as only 2 papers have mentioned 'Identification of Objectives' as a stage [6], [7]. Very few papers mentioned 'Training' which can have a negative impact on the implementation process as users would not be aware of the functionality and interaction of the newly proposed system [5], [6], [11], [12]. Figure 1 shows the list of implementation stages identified from the SLR.
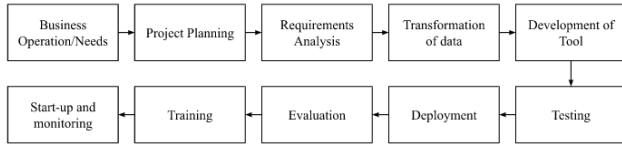

Figure 1. BI Implementation Stages

B. Critical Success Factors

The CSFs would help organizations address both technical and business orientation issues [14]. The frequency of occurrence of the CSFs in the research papers was analyzed. Some CSFs have been commonly identified in multiple papers [3], [8], [12] - [19]. This shows the importance of the CSFs in the implementation phase as different researchers have identified similar CSFs. Moreover, CSFs could be considered duplicates and hence can be grouped together to finalize a final list of CSFs [15], [18]. This made sure that the success factor has been identified and followed, without considering duplicates or creating confusion in the mind of the BI stakeholder. Table 1 shows the list of the CSFs identified whilst conducting the SLR.

Table 1
Critical Success Factors

CSF	Sources
Team Skills	[8] [19] [16]
Data Management	[3] [14] [16]
Appropriate Technology	[3]
Clear Business Objectives	[8]
Team Composition	[12]
Project Management	[3]
Change Management	[8]
User Involvement	[16]
Clear User Expectations	[16]
Defined Requirements	[17]
User Satisfaction	[18]
Human Resource Management	[16]
Peer Support	[15][19]
Subjective Norm	[3]
Good IT Infrastructure	[16]
Third-Party Interactions	[15]
Management Support	[8]
Committed Stakeholders	[3][12]
Project Scope Mgmt.	[3] [19]
Adequate Resources	[3] [15]
Friendly Technologies	[15]
User Training	[15] [19]
Good Communication	[3]
Leadership	[16]
System Quality	[17] [19]
Work Attitudes	[17] [18]
Operation Focus	[3]
Customer Management	[18]

Visibility	[19]
External Environment	[3]
Developer Skills	[18] [3]

Most of the researchers have simply identified and listed the CSFs during the implementation, without considering if the organization can meet these CSFs as per their resources, budget, or development time available for the BI project [8], [14], [15], [16]. Moreover, none of the papers analyzed in the SLR identified any level of importance of the CSFs or categorized them as per their prioritization. It is expected that most of the identified CSFs need to be met for a successful implementation, however, in exceptional cases, a pre-defined list of prioritized CSFs would help organizations during the implementation.

C. Existing BI Frameworks

To have a clear understanding of the existing frameworks for BI implementation, several frameworks were analyzed [3], [13], [19] - [21]. Throughout the SLR, it was found that a few existing BI frameworks have been broken down into main constructs which were further broken down into sub-sections [3], [13]. However, it has been found that most of the research papers listed the main concepts without segregating them into main constructs [19] - [21]. This can lead to a misunderstanding of the concepts as there is no structure to follow. The following CSF categories were identified whilst analyzing all relevant existing frameworks: 'Organizational', 'People', and 'Technical' [3], [13]. In [3], 'People' was one of the major constructs as the researchers found that work attitudes, technology experience, and user expectation are as important as project management, IT infrastructure, or management process.

D. BI Implementation Roles

The BIS implementation consists of various people with different skills and experiences [22]. The team consists of both cross-functional from different business areas and people with strong technical skills [23]. The business team during the implementation phases will make sure that the business requirements are met, compared to the technical team who will make sure that the requirements are achieved with the appropriate techniques [23]. A 'Champion' is also required who has a deep knowledge of the business and technical domain, acting as a lead and support would need to consider and follow different CSF compared to an external consultant who also plays a vital role as he/she is the one who overcomes the lack of in-house experience and competencies [23]. However, none of the research papers analyzed in this SLR have related their proposed CSF frameworks with the roles of the different roles involved.

E. Conclusion

Based on the analysis conducted in the SLR, we have set the following relationship between the main factors such as implementation stages, CSFs, existing frameworks, implementation roles, and CSF prioritization. Very few existing frameworks relate their CSFs and the implementation stages involved [3], [13]. Other frameworks could have improved their selection of the CSFs and broken down the different implementation phases into sub-stages for a better understanding and interpretation of the proposed frameworks [19] - [21]. It was also found that none of the existing frameworks involved the implementation roles nor the prioritization of CSFs. However, the benefits of

conducting this SLR have provided the ability to understand the complete implementation process from analyzing the organization's needs stage in the pre-implementation phase to the Training & Maintenance stage in the post-implementation phase. We were also able to identify the various CSFs involved in the BI Implementation.

III. METHODOLOGY

This section describes the methods that were used in conducting the research. It was essential to capture data from both secondary and primary sources to achieve this research's previously defined aims and objectives. The SLR was used as the secondary research whilst two surveys were the primary research. A mixed research methodology has been used to collect valuable information as both quantitative and qualitative data were collected [24]. Appropriate analysis methods such as statistical tools for quantitative data and content analysis for qualitative data were used. Online questionnaires were used for data collection as they would address the accessibility issues. It was also considered a well-established strategy as a web survey is the most commonly used as the respondents can fill in & participate at their own convenience.

The first survey was used to collect other pieces of information which were not captured by the SLR. It was shared with BI stakeholders via connections on LinkedIn, WhatsApp groups, and directly to those concerned. The aim of the first survey was to capture responses from BI stakeholders involved in the BI implementation. The exact number of the audience was unknown as the first survey was open both locally and internationally. Hence, purposive sampling was used to capture the maximum relevant responses [25] and the targeted responses were set to 100.

A second survey was needed to validate the proposed framework. For the evaluation process, the survey used consisted of various criteria for evaluation [26], [27]. To increase its effectiveness, the questionnaire was circulated to six BI experts who were working on a project which reached different levels. The BI expert's requirements were to have at least five years of BIS implementation. Since the author was already involved in the BI implementation, his contacts were used to identify the BI experts for the second survey. The feedback of the six BI experts from three stages (start, midway, and end of a BIS implementation) would help the evaluation process be unbiased and obtain a better version of the proposed framework.

Moreover, to obtain unbiased responses, it was ascertained that the same person did not participate in both surveys. The BI experts from the second survey did not participate in the first survey. Eighty-six responses were obtained for the first survey, showing a response rate of 86%. For the second survey, all six BI experts provided their feedback, showing a response rate of 100%.

IV. DEVELOPING FRAMEWORK

The information obtained from the SLR and analysis of results from the first survey was used to develop a framework for implementing a BIS. This section describes the development of the proposed BI framework which response to the RQ2 of the study. The following steps were taken to conclude the design of the proposed framework for implementing a BIS.

A. Identification of Main Components from SLR

As illustrated in section II, various research papers were analyzed regarding CSFs, implementation stages of a BI project, and existing BI frameworks. Three main implementation phases namely: Pre-Implementation, Implementation and Post-Implementation were identified [3]. In addition to this, ten implementation sub-stages were identified. Thirty-one CSFs were also identified. Other important points such as the prioritization of CSFs and implementation roles were also considered as none of the research papers analyzed had linked the CSFs with their corresponding prioritization and implementation roles. Hence, the main components such as the implementation stages and CSFs were identified from the SLR, in addition to the various factors on how the proposed framework could be an innovation and solution to existing frameworks identified.

B. Design of a Generic Framework

A generic framework has been proposed from all the insights obtained from the SLR. It could be concluded that there were numerous research papers that talked about the implementation stages and CSFs involved in the implementation of a BIS. However, not many of them correlated the CSFs with their relevant implementation stages or with the relevant implementation roles or CSF's priority. Hence, this was taken into consideration whilst designing the structure of the proposed framework, making sure that the proposed framework consists of CSFs, implementation stages, together with the priority of CSFs and implementation roles which would be an innovation to existing BI frameworks.

C. Using Insights from the Survey to Complete the Framework.

The aim of the first survey was to validate all the findings obtained from the SLR. The participants were asked about their opinions on the pre-defined implementation stages and list of CSFs. The analysis of the responses showed that all the pre-defined lists of ten implementation stages and thirty-one CSFs were relevant to the BI implementation process.

The survey also aimed to identify all the missing points from the SLR which would help in the development of the BI framework. One of the missing factors from the SLR was the prioritization of CSFs. Initially from the survey, the participants were asked to rate each CSF from 1 (High Importance) - 5 (Low Importance). However, none of the participants voted for any CSF as Priority 5. Hence, only four levels of CSF priorities were used during the design of the framework: Priority 1 (High Importance), Priority 2 (Important), Priority 3 (Low Importance) and Priority 4 (Least Importance). After analyzing the survey responses, each of the thirty-one pre-defined CSFs could be categorized in a priority as shown in Table 4 of section V.

Moreover, the first survey also helped us to identify the five main roles in the BI implementation process, namely: 'Project Manager', 'Resource Manager', 'Team Leader', 'Technical Engineer' and 'Functional Consultant'. For each implementation stage, the participants selected two roles that they believed were most important and had the most influence on the implementation process.

The participants were also asked to classify each pre-defined CSFs into their respective categories: 'Organizational', 'People' and 'Technical'. The categories were identified via the SLR, however, none of the research

papers categorized the CSFs as per these specific categories. It was concluded that most of the findings from the SLR were aligned with the results obtained from the first survey. It was also used to get the views of BI stakeholders on the implementation of such a BI framework. As per the stats obtained, it was concluded that such a BI framework would help most of the participants in their daily tasks and responsibilities.

D. Proposing Framework for BI Implementation

After going through the steps described previously, an initial BI framework was developed. The design of the framework has allowed the CSFs to be categorized by each implementation phase, sub-stages, categories, roles, and priority. The proposed framework proposes a structure, together with a CSF naming convention table which would help to identify the CSFs in the framework.

E. Framework Evaluation

As mentioned in section III, a second survey was used to validate the proposed framework. This section addresses **RQ3**. As quantitative results, the BI experts were presented with a scale of 0 – 10 which was used to rate the framework. Table 2 below shows the scale rating and its outcome.

Table 2
Scale Rating & Outcome

Rating	Outcome	Revisions
0 - 4	Fail	Total Change Required
5 - 6	Satisfactory	Minor Changes Required
7 - 8	Good	No Revisions Required
9 – 10	Excellent	No Revisions Required

The BI experts rated the proposed BI framework based on the following criteria [24]. Table 3 shows the various evaluation criteria, their descriptions, and their corresponding mean ratings.

Table 3
Evaluation Ratings

Criteria	Description	Mean Rating
Effectiveness	Achievement of pre-defined objectives	8.0
Logical flow	Structure and flow of framework	7.8
Relevance	The usefulness of the framework for the pre-defined purpose	7.5
Usability	The degree of how easily understandable the framework is.	7.6
Impact	Contribution of framework to industry	7.5
Efficiency	Usage of resources	8.3
Coherence	How framework fits in workload &implementation process	8.0

The above information can be interpreted both individually and on an overall basis. For instance, the average rating for effectiveness was 8.0 meaning that the framework's effectiveness is 'Good'. Overall, the lowest score is 7.5 and the highest is 8.3; meaning that overall, the proposed framework is also 'Good'.

As qualitative results, the BI experts were asked open-ended questions about their opinions on the proposed framework. Content Analysis was done after which relevant codes to the responses were identified. Table 4 shows the coding process for the content analysis.

Table 4
Content Analysis – Coding

Code	Description
Code 1	The expert is not satisfied at all. A total change of the framework is required
Code 2	The expert believes that there are major changes to be done in the framework.
Code 3	The expert believes that there are minor changes to be done in the framework.
Code 4	The expert finds the framework excellent. No change is required

The data was interpreted by using graphical figures and text interpretations. Two experts believed that the framework was excellent, and no change was required. On the other hand, four experts believed that there were minor changes to be made in the framework.

The BI experts were also asked about the content and structure of the framework, whether it was CSFs, stages, roles, or priorities. The experts advised changing some CSFs, priorities of some CSFs, and removing one sub-stage 'Start-up & Monitoring'. Upon their recommendation, relevant changes were made to the initially proposed framework to come up with the final one. Section V illustrates the final framework and the naming convention table, after making all the changes recommended by experts in the evaluation process.Manuscript with less than 4 pages or exceeding 10 pages may be unable to be included in the Journal.

V. FINAL FRAMEWORK

A. Structure of Proposed Framework

The proposed framework consists of CSFs categorized by each main phase, sub-stages, categories, roles, and priority which would help in the implementation of the BIS. Figure 2 shows the proposed BI framework for this study, after considering the recommendations from the BI experts in the evaluation process. The dark circle represents the CSF.
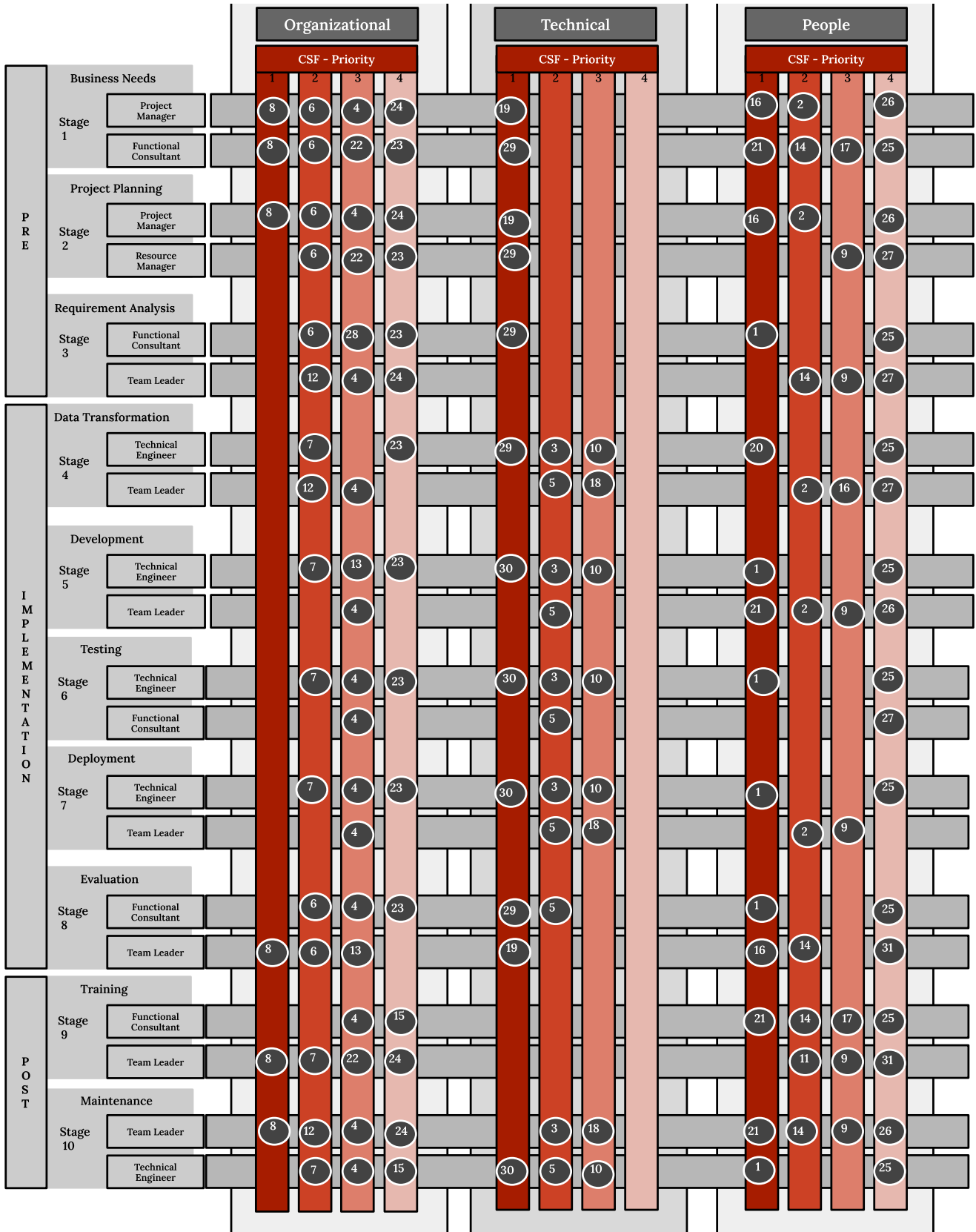
Phase	Stage	Role	Org 1	Org 2	Org 3	Org 4	Tech 1	Tech 2	Tech 3	Tech 4	People 1	People 2	People 3	People 4
PRE	**Business Needs** Stage 1	Project Manager	8	6	4	24	19				16	2		26
PRE	Stage 1	Functional Consultant	8	6	22	23	29				21	14	17	25
PRE	**Project Planning** Stage 2	Project Manager	8	6	4	24	19				16	2		26
PRE	Stage 2	Resource Manager		6	22	23	29						9	27
PRE	**Requirement Analysis** Stage 3	Functional Consultant		6	28	23	29				1			25
PRE	Stage 3	Team Leader		12	4	24						14	9	27
IMPLEMENTATION	**Data Transformation** Stage 4	Technical Engineer		7		23	29	3	10		20			25
IMPLEMENTATION	Stage 4	Team Leader		12	4			5	18			2	16	27
IMPLEMENTATION	**Development** Stage 5	Technical Engineer		7	13	23	30	3	10		1			25
IMPLEMENTATION	Stage 5	Team Leader			4			5			21	2	9	26
IMPLEMENTATION	**Testing** Stage 6	Technical Engineer		7	4	23	30	3	10		1			25
IMPLEMENTATION	Stage 6	Functional Consultant			4			5						27
IMPLEMENTATION	**Deployment** Stage 7	Technical Engineer		7	4	23	30	3	10		1			25
IMPLEMENTATION	Stage 7	Team Leader			4			5	18			2	9	
IMPLEMENTATION	**Evaluation** Stage 8	Functional Consultant		6	4	23	29	5			1			25
IMPLEMENTATION	Stage 8	Team Leader	8	6	13		19				16	14		31
POST	**Training** Stage 9	Functional Consultant			4	15					21	14	17	25
POST	Stage 9	Team Leader	8	7	22	24						11	9	31
POST	**Maintenance** Stage 10	Team Leader	8	12	4	24		3	18		21	14	9	26
POST	Stage 10	Technical Engineer		7	4	15	30	5	10		1			25

Figure 2. Proposed Framework

B. CSFs Codification Table

The proposed framework also consists of a CSF codification table, shown in Table 5, which would help to identify the CSFs in the framework. One needs to relate the CSF numbering from the framework to the CSFs codification table.

Table 5
CSFs Codification

CSF Number	Description	Priority
1	Good Team Skills	2
2	Good Management Support	2
3	Effective Data Management	2
4	Committed Stakeholders	3
5	Appropriate Technology	2
6	Project Scope	2
7	Adequate Resources	2
8	Clear Business Objectives	1
9	Balanced Team Composition	3
10	Friendly Technologies	3
11	Proper Training	2
12	Project management	2
13	Change Management	3
14	Good Feedback	2
15	User involvement	4
16	Proper Leadership	3
17	Clear user expectations	3
18	Good System Quality	3
19	Well-defined Requirements	2
20	Proper Work Attitudes	3
21	User Satisfaction	1
22	Operation Focus	3
23	HR Management	4
24	Good Customer Management	4
25	Peer support	4
26	Proper Visibility	4
27	Subjective norm	4
28	Good External environment	3
29	Adequate IT infrastructure	1
30	Adequate Developer skills	1
31	Good Third-party interactions	4

C. Framework's Main Components

The proposed framework allows thirty-one CSFs which were identified from the SLR and validated by participants in the first survey. The dark circles in the framework represent the CSFs. As can be seen in the framework, the CSFs are classified into categories and implementation stages.

The design of the framework has allowed the CSFs to be categorized into main phases namely 'Pre-Implementation', 'Implementation', and 'post-Implementation'. Ten implementation sub-stages, starting from 'Business Needs' to 'Maintenance' was considered for this framework.

The proposed framework allows the CSFs to be segregated into 3 main categories namely, 'Organizational', 'People', and 'Technical' which were identified in the SLR and validated by participants in the survey conducted.

The framework also consists of a priority list of four levels (P1, P2, P3, P4) for the CSFs which were obtained from the first survey. The priority (Red color coding) represents the priority in each category.

The proposed framework also provides a structure that would cater to two roles in each sub-stage of the implementation process. For each stage, these roles were identified as per their highest importance and impact on the implementation process.

VI. DISCUSSION

This section elaborates on the main aspects considered during the evaluation of the framework as illustrated in Figure 2. In the implementation of a BIS, it is very important to know each stage of the implementation process. Therefore, in the proposed framework, all the possible stages in the implementation process are incorporated. Based on findings from the SLR and surveys results, three main stages and ten implementation sub-stages were identified in the final BI framework.

The CSFs are the main backbone of the proposed framework. It should be noted that none of the existing frameworks analyzed in this paper considered prioritization and categorization of CSFs. As another contribution to the proposed framework, the two main aspects used to group the CSFs are: 1) Prioritization and 2) Category. A list of CSFs was obtained from the SLR, and it was noted that certain CSFs were commonly identified in multiple existing papers which further emphasized their importance. These duplicates were therefore removed and grouped together, ensuring that no important CSFs were missed out. Moreover, none of the existing papers had a prioritization order of the CSFs. Therefore, an initial prioritization list was complied based on the results of the first survey. For category, three main groups were identified: People, Technical and Organizational. This grouping is expected to all implementation stakeholders remain focused on the specific areas and the resources that they need to manage.

Based on the results of the SLR, the BIS implementation involved many people with different skills and experiences. However, none of the papers in SLR have related their proposed frameworks or the CSFs with the roles of the different stakeholders involved. Therefore, the inclusion of roles is yet another contribution in the proposed framework. With the help of the first survey conducted, the proposed framework has categorized the CSFs as per the different roles involved in the implementation process. Each role (for instance Developers, Consultants, Team Leader, and others) will know exactly which CSFs to focus on and in which stage these CSFs are important.

As discussed in this section, the proposed framework is designed, by taking into consideration different research gaps in this domain. Therefore, the main contribution of this work is the proposed framework that incorporates CSFs (including

prioritization and categorization), implementation stages and roles.

It is expected that this proposed framework can help different stakeholders involved in the implementation of a Business Intelligence system. More insights could be obtained to further enhance the proposed framework if the latter could be experimented with in different settings such as projects of different sizes, complexity, domains. It is expected that this proposed framework can enhance research in this discipline.

VII. CONCLUSION

As can be seen throughout the study, as an innovative aspect, the research study proposes a framework that categorizes the various CSFs as per the different BI implementation stages, roles, categories, and priorities. The structure of this framework would help BI stakeholders involved in the BIS implementation, to better understand and identify the CSFs throughout the implementation process. Each stakeholder would know which CSFs are related to them (since CSFs are categorized as per roles) and where to apply them (since CSFs are categorized as per stages). They would also know which CSFs are more important to be considered (since CSFs are categorized as per priorities).

A. *Responding to Research Questions*

Throughout the study, we concluded that all three research questions were responded to accordingly. For **RQ1**, throughout, an SLR was conducted to find the implications of implementing a framework for BIS. The SLR provided lots of insights into CSFs, implementation stages, and existing BI frameworks. However, out of the twenty-eight research papers analyzed, it was found that no research papers have linked CSFs, implementation stages, roles, and priority in a single framework. Surveys were then used to gather real-scenarios insights as primary research. The participants had the opportunity to share their opinions on the various concepts for the implementation of a BIS. A total number of 86 participants shared their opinions via the survey where most of the participants (51.2%) have working experience in BI varying from 1 - 5 years and only 5.8 % of them have only 10 years.

To respond to **RQ2**, the information obtained from the SLR and analysis of results from the first survey were used to develop a framework for implementing a BIS. The major point considered when developing the proposed framework was to make sure that all the main components; CSFs, implementation stages, roles, and priority are properly linked in a single framework. The components of the proposed framework were also discussed and the reasons behind the design of the framework were mentioned. The discussion was also made on how the proposed framework has resolved all the issues identified in the SLR.

RQ3 was used for the framework evaluation whereby the BI experts evaluated and provided feedback on the proposed framework. The targeted response rate was 70% but pleasantly all (100%) responded positively. As quantitative responses: the lowest score was 7.5 and the highest was 8.3; meaning that overall, the proposed framework was 'Good'. In terms of effectiveness, the framework was rated 8.0 (Good), which is considered as the achievement of the pre-defined objectives. In terms of coherence, the framework received 7.5 (Good). Although the same rating applies for

effectiveness and coherence (Good), there is still room for improvement for coherence regarding the framework's fitness in the BI industry and its impact in the market. As qualitative responses, four codes were used (refer to Table 4) for content analysis. Based on this coding scheme, 33.3% of experts believed that the framework was excellent, and no change was required. The other 66.6% of experts believed that there were minor changes to be made in the framework. The relevant recommendations were incorporated in the final framework.

BI experts strongly believed that the proposed BI framework would help in the implementation of BIS. Therefore, based on these initial results, it can be concluded that the aim and objectives of this research work were met.

B. *Limitations*

As limitations, there were very few academic research materials on CSFs, associated with implementation stages. Due to time constraints, the evaluation process involved only six BI experts as each of their feedback needed to be considered in the final framework. If more BI experts had been considered, the evaluation process would have been better. The reliability of the framework is therefore not conclusive, and more experimentation is required with a larger population. Moreover, the behavior of the proposed framework needs to be experimented with different project size and complexity.

C. *Future Works*

The proposed framework considers mainly the development of BIS which is related to Waterfall models. The framework will need to be able to accommodate other lifecycle scenarios, for instance, in an Agile Model. Moreover, more roles can be added in each phase of the development. The proposed framework is limited to two roles per sub-stage; however, it will be beneficial if more roles can be added. Moreover, the end-users have some responsibility towards the development of a BIS. In future work, the framework can involve end-users as one role and classify the CSFs as that specific role. In addition to these, for further validation, the framework will have to be used during the implementation of a BI system as this will help in confirming the framework's practicality and effectiveness in real scenarios.

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