A Coherent Framework for Understanding Critical Success Factors of ICT Project Environment

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Abstract—Although there has been significant research on information and communication technology (ICT) project success, but there are still gaps around this field. Thus, further understanding to ensure the level of ICT project success is still required in both theory and practice. The ultimate aim of this study is to develop a coherent critical success factors (CSFs) framework for helping ICT project managers to deal with the complexity of project dimensions which have influenced the shaping of project success. The four consideration points in this framework development are: first, based on a comprehensive success definition as guidance for measuring the critical connection between the success criteria level and the CSFs level; second, integrating coherently four project dimensions for encouraging the high content validity; third, presenting the alternating critical connection between the project success definition and the CSFs determination; lastly, adopting the project stakeholder perceptions from multiple levels of an ICT project organization’s environment. However, it is a proposition concept, but this proposed CSF framework is reasonable in the context of the ICT project success improvement. 

Keywords—ICT project; CSF framework; success criteria; project dimensions; CSFs

I. INTRODUCTION

However, project management is a relatively mature discipline in the context of standardizations [1-3], best practices [1], research articles [3,4], and in its community of professional practitioners [6,7], but scholars [8-10] mentioned that this is not in the ICT projects environment domain. Specifically, authors identified the five gaps around it, namely: the high rate of the project failures, the ambiguous project success definition, the use of different project dimensions in project success measurement, and the use of different CSFs identification methods. Based on these identified gaps, the ICT community still needs a reliable framework for measuring the project performance attainment and one of the challenges here is how the ICT development projects can be better managed to increase chances of success.

The paper tried to present a coherent CSF framework development based on four consideration points: the comprehensive success definition guidance, integrating coherently four project dimensions, presenting the alternating critical connection between the project success definition and the CSFs determination, and adopting the project stakeholder perceptions from multiple project organization levels.

The next section highlights the gaps around the ICT project performance studies. The following parts are literature review which it elaborated the previous concepts, the proposed framework development, and the last part of the paper is concluded with suggestion for further studies.

II. THE SIX GAPS AROUND ICT PROJECT SUCCESS

The five identified gaps which are considered and encouraged for developing this framework are: first, various studies [11-20] have been presenting that the majority of the ICT projects are unsuccessful and unbalanced [18]. Although, [20,21] questioned and criticized these findings, but the next researchers [22] published constantly the failure evidences. The successful ICT projects can encourage business operations to improve products and to enhance services, but, in contrast, its failures can cause substantial financial losses to an organization and even jeopardize its survival [23].

Second, scholars [24-26] mentioned indirectly that project success is an ambiguous concept and it had been discussing especially for the criteria by which success will have judged. However, a project management is performed well and the project could be considered ‘‘successful”’, it is also probable to be a futile project in the context of the success criteria indifferences [27].

Third, several researchers [27-31] used partially the project dimensions to describe the project success theories in their studies. While, the others [32] mentioned that an overall framework can be developed coherently through integrating the dimensions. Petter, DeLone, and McLean [33] described that a multidimensional measurement will support the high content validity. Hence, the use of multidimensional measurement is more reasonable to explore the ICT project performance, rather than partial ones [34].

Fourth, researchers [35] asserted that when using the CSFs method as a planning tool, managers from multiple levels of an organization’s hierarchy must be interviewed. Even, Van Aken [36] mentioned ‘‘the satisfaction of all stakeholders”’ as his project success definition. In contrast, several scholars only used one or partial stakeholders as their research respondents, such as top management [37],

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project manager [22,38,39], user [40,41], project team member and project manager [42], ICT experts and faculty members [43], professionals [44] in their researches; a lack in the stakeholder approaches [45]. It may be one of reasons why scholars [45] proposed a role-based stakeholder classification model to gather a comprehensive perspective around ICT project performance.

The last identified gaps, authors recorded that researchers [35,46] used the top-down method to elaborate CSFs in their project performance studies in the early CSFs study era. While, the next researchers [19,20,29,32,34,38,39,42,47,48] developed the bottom-up method by identifying, classifying and grouping an amount of CSFs. Definitely, each of these methods have strengths and weaknesses, but would have got an alternative method if these methods had combined [49]. However, this combination may be better method than the previous methods, but authors have not yet find specifically a research around it.

Against these gaps, ICT community still needs an alternative framework for understanding CSFs of ICT project environment. The challenge here is how the ICT development projects can be better improved to increase chances of success. Moreover, it will help ICT project managers in dealing with the complexity of project dimensions environment.

III. LITERATURE REVIEW

A. Project Success Criteria

Success is an interesting word which connotes with different things to different people, and very context-dependent [31]. A number of scholars [24-26] mentioned indirectly that it is an ambiguous concept and it has been discussing especially for the criteria by which success will be judged. However, a project management is performed well and the project can be considered ‘‘successful’’, it is also probable to be a futile project in the context of the success criteria [27]. De Witt [27] concluded that the most appropriate criteria for success is the degree to which project met its objectives. This concept will be complex if one considers overall stakeholder perceptions from technical aspects, operational aspects, managerial issues, and strategic agendas [27,50].

Traditionally, Atkinson [30] formulated project success based on three criteria: time, cost, and quality. Although, it was criticized by some scholars [51] because of incapable to represent the comprehensive success criteria, but it provided a basic understanding for the project success theory. Further, researchers incremented this triangle model with the customer satisfaction [23,51] and the fulfilment of functional requirements [52].

In short, Jugdev and Muller [31] contextualized comprehensively the previous concepts as “efficiency” and “effectiveness”. Efficient is focused on the iron triangle model [30] to measure technically the project performance as concluded by Belasi and Tukel [53] that the capability or resource ownership has consequences for project organization. Effective is significance of the intangible appropriate to the stakeholder expectations [31], as stated also by Yeo [54] that even if the ICT project sounded successful, it may still meet with resistance or rejection by stakeholders, because of unfulfilled their needs [52].

B. Project Dimensions

It is a better way to develop a holistic framework which represent many aspects for understanding ICT project success performances as suggested by Westerveld [32] that a possible way to develop an overall framework, use the multidimensional perspectives [33,55,56] not only focused at the operational level, but also managerial level and strategic level [29,31,54]. This is because of most of the ICT project problems are related to managerial, organizational, human and culture issues, not only technical problems [35]. There are four project dimensions which are proposed by authors for developing the coherent framework for understanding CSFs in ICT project environment:

1) Systematical Dimensions

Specifically, Belasi and Tukel [53] concluded that the capability or resource ownership has consequences for project success. This is appropriate with the technical project success concepts about efficiency and effectiveness [31]. Researchers formulated these resources, including time, cost, quality [30], technology, people, process and structure [57]. However, these attributes and their relationships in a project can be used as a parameter measuring project success [57], but these are used differently and separately by a number of researchers [25,26,58-63] in their studies.

2) Managerial Dimensions

Researches [27,28,31,53,64] mentioned that one of factors which influence the project performance is managerial aspects. Clearly, De Witt [27] elucidated that regardless of poor project management, project could be considered “successful” and it is also probable that a project is futile despite of project management was performed well. Further, scholars [27,64] separated the project performance and the project management performance, and distinguished the project life cycle and the product life cycle [27,31,64,65] for simplifying the project complexities. Specifically, Jugdev and Muller [31] decomposed the project cycle to be conception, planning, and implementation, and the product cycle consist of handover, utilization, and close down [31]. This concept show that the project life cycle is related with the processes during the project itself and the product life cycle represents the business process included the project process.

3) Directional Dimensions

Numerous researchers [26,27,32,50,59-63,66,67] mentioned the directional issues including project objective determinations, project goal definitions, business mission...
attainments or organization vision directions are the several of CSFs in their studies. Generally, [53] recorded that scholars classified CSFs based on strategic aspects and tactical aspects. Furthermore, Wateridge [68] concluded that the technical success level only refers to the achievement of short-term goals related to the managerial duties of project manager because their futures may depend on it. He also stated that users and project sponsors have different perceptions; the users may prefer the results of the project which can be applied to short-term, and, on the other hand, the project sponsor may wish the long-term advantages [68].

In short, the success of project can be measured based on various stakeholder interests [54] according to technical issues (short-term), tactical issues (medium-term) and strategic issues (long-term).

4) Environmental Dimensions

Marnewick and Labuschagne [3] concluded that the alignment between project and business objectives influences the perceive of success and it changed over times related to the environmental changes [26,27,32,50,59-63,66,67]. While, most of the ICT project problems are related to management, organizational, human and culture issues, not technical problems [28]. Specifically, Howsawi, Eager, and Bagia [29] designed a project success measurement concept based on the project environment dimensions, namely: context level, business level, deliverable level, and process level. Further, they concluded that it contributes to the body of knowledge by highlighting the effect of the context-related criteria on project success definition and planning [29]. In short, a specific characteristic of CSFs were inherited from the particular environment in where it operates [10,69].

C. Critical Success Factors (CSFs)

De Wit [27] who referred Haifield [70], interpreted CSFs as “a number of factors that determine the successful outcome of a project” and the others [51] stated that success factors are any circumstance, fact, or influence which contributes to a result which needs to be done correctly to ensure the success of project. Retrospectively, CSFs have been researching by scholars [46,70] since the end of 1970s and this topic is still interesting now because of researchers need to continue their effort to explore new possibilities of achieving the success of project [23].

Jugdev and Muller [31] even recorded that most of the CSFs literatures during 1980s-1990s contributed on identifying categories of success, but only focused at the business operational level and lack in the depth of framework integration [31]. Numerous researchers [19,20,32,34,38,42,72] used a bottom-up concept for identifying CSFs through taking across identifying, classifying and grouping CSFs. This method is relatively easy to use, but lacks to present a coherent connection between CSFs level and success dimension level [20]. On the other hand, Rockart [46] introduced how to identify critical areas and to initiate the performance initiations which reflected those areas [35]. However, several researchers said that this top-down method is relatively difficult to use [35] and human biased [10,20,35], but the others mentioned that this top-down concept lends a sense of consistency and completeness [35]. Therefore, researchers [49] tried to develop an alternative method for sharing several strengths, weaknesses, and limitations both concepts.

In brief, Westerveld [32] stated that a possible way to develop an overall framework use the multidimensional perspectives [33,55,56] not only focused at the operational level, but also managerial level and strategic level [29,31,54] because of majority of the ICT project problems are related to these aspects, not only technical problems [28]. Hence, authors tried to develop a coherent framework based on critical connections between project success criteria, project dimensions and CSFs as it suggested by researchers [17].

IV. THE PROPOSED CSFS FRAMEWORK DEVELOPMENT

According to the six stated gaps on the early pages and reviewing the previous literatures, authors proposed a coherent framework for understanding CSFs of ICT project environment as presented by Table II. The four main points of this development are:

Firstly, authors define that ICT project success is a project which it is conducted efficiently [31,73,74] and effectively [31,74] to produce a project result which it fulfilled the business functional requirements [52,54] and the stakeholder satisfactions [23,27,31,50,51,54]. Based on this definition, authors identify four success criteria, namely: efficiency, effectiveness, fulfillment of the business functional requirements, and stakeholder satisfactions. These criteria will be guidance for formulating the project dimensions to measure the critical connection between the success criteria level and the CSFs level [20].

Secondly, the proposed framework integrated coherently four project dimensions, as suggested by [32] to encourage the high content validity [33] on project success measurement. The dimensions are systematical dimension [25,26,30,31,53,57,63], managerial dimension [27,28,31,53,64,65], directional dimension [26,27,32,50,53,54,59-63,66-68], and environmental dimension [3,10,26-29,32,50,59-63,66,67,69]. Researchers [34] mentioned that the use of multidimensional measurement is more reasonable to describe the ICT project performance, rather than use the partial ones.

Thirdly, authors adopted the combination CSFs determination method [49] for determining CSFs. This method combined the top-down method [35,46] and the bottom-up method which it is used indirectly by [19,20,29,32,34,38,39,42,47,48]. The aimed is to share several strengths and weaknesses both previous method [49]. However, this combination may be better method than the previous ones, but authors have not yet find specifically a research around it [49]. The eighteen CSFs are bring-
downed based on the four formulated project dimensions as represented by table below.

<table>
<thead>
<tr>
<th>Dimensions</th>
<th>Research Variables</th>
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<tbody>
<tr>
<td>Systematical</td>
<td>Factor related to cost</td>
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<tr>
<td></td>
<td>Factor related to time</td>
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<tr>
<td></td>
<td>Factor related to quality</td>
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<td>Factor related to people</td>
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<td>Factor related to technology</td>
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<tr>
<td>Managerial</td>
<td>Factor related to conception</td>
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<td>Factor related to planning</td>
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<td>Factor related to implementation</td>
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<td>Factor related to handover</td>
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<td></td>
<td>Factor related to utilization</td>
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<td></td>
<td>Factor related to close down</td>
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<tr>
<td>Directional</td>
<td>Support short term direction</td>
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<td></td>
<td>Support middle term direction</td>
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<td>Support long term direction</td>
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<tr>
<td>Environmental</td>
<td>Factor related to project Process</td>
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<td></td>
<td>Factor related to deliverable level</td>
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<td></td>
<td>Factor related to business level</td>
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<td>Factor related to context level</td>
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Fourthly, the framework presented the climb-down critical connection between project success, project success criteria, project dimensions, and CSFs which it is suggested by [20,45,46] as figured by Figure 1. Alternately, it means that the identified CSFs are formulated from the project success criteria and inversely.

Lastly, the framework is also developed to accommodate the project stakeholder perceptions from multiple levels of an ICT project organization’s environment appropriate to assertions by [27,35,36,50] as illustrated crossly by the stakeholder satisfactions line (Table I) which it across the managerial dimensions, directional dimensions, and environmental dimensions.

In short, the proposed CSFs framework will help the ICT project managers on dealing with the complexity of ICT project environment. They can identified the CSF areas based on crossing the four project dimensions, the stakeholder focuses, and the project success criteria.

### Table II. The Coherent CSFs Framework for ICT Project Environment

<table>
<thead>
<tr>
<th>ICT Project Stakeholders</th>
<th>Consultants</th>
<th>Suppliers</th>
<th>ICT Key Users</th>
<th>End Users</th>
<th>Business Key Users</th>
<th>Project Managers</th>
<th>Top Managers</th>
</tr>
</thead>
<tbody>
<tr>
<td>People</td>
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<td>Cost/ Budget</td>
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<td>Time</td>
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<td>Quality</td>
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<tr>
<td>Technology</td>
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</table>

**Figure 1. The alternating critical connection**

The first challenge of ICT use in business organizations is measuring the ICT project success because of the failures can cause substantial financial losses and even jeopardize their survivals [23]. While, the dimension of ICT project is complex, related to numerous aspects, such as personal, organizational, managerial, cultural [35] and environmental [29], not only technical ones [35]. The ultimate aim is help project managers for understanding CSFs in the complexity of ICT project environment by crossing the four project dimensions, the stakeholder focuses, and the project success criteria.

### I. Conclusion

The first challenge of ICT use in business organizations is measuring the ICT project success because of the failures can cause substantial financial losses and even jeopardize their survivals [23]. While, the dimension of ICT project is complex, related to numerous aspects, such as personal, organizational, managerial, cultural [35] and environmental [29], not only technical ones [35]. The ultimate aim is help project managers for understanding CSFs in the complexity of ICT project environment by crossing the four project dimensions, the stakeholder focuses, and the project success criteria.
The four development consideration points are: first, based on a comprehensive success definition as guidance for measuring the critical connection between the success criteria level and the CSFs level; second, integrating coherently four project dimensions for encouraging the high content validity; third, presenting the alternating critical connection between the project success definition and the CSFs determination; lastly, adopting the project stakeholder perceptions from multiple levels of an ICT project organization’s environment.

However, it is a proposition concept, but this proposed CSF framework is reasonable in the context of the ICT project success improvement. Moreover, additional researches are needed to establish qualitatively and quantitatively the validity of this framework, particularly for formulating the project dimensions and determining CSFs based on a comparison from the previous study.

REFERENCES


