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The Critical Success Factors (CSFs) for IT Projects

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Abstract—Huge yearly investments were made by organizations for the development and maintenance. However, it has been reported that most of the IT projects fails as it is delayed, over budget and discontinued quality. A systematic literature review (SLR) was conducted to identify the critical success factors (CSFs) for the IT projects. Nine (9) CSFs was identified from the SLR. An online survey was conducted among 103 respondents from developers and IT managers. The data was analyzed using the Statistical Package for Social Science (SPSS 22). The findings showed that the highest CSFs of IT projects is commitment and motivation. Project monitoring was found the lowest score ranked by respondents.

Index Terms—Critical Success Factor; IT Projects; Systematic Literature Review

I. INTRODUCTION

IT systems have become very important because most companies depend on them and the operations of these companies and organizations have become increasingly automated and computerized. To develop, improve and maintain these systems, large amounts of money have been invested in Information Technology (IT) projects. It is very important for businesses to be able to manage IT projects successfully. Despite how important IT projects are, The Standish Group [1] revealed in the latest version of their CHAOS report that IT projects share that exceeds budget and time, or does not meet the basic requirements of the systems is continuously high and it is shown in Figure 1.



Figure 1: Standish Group 2015 Chaos Report [1]

Successful project is the project that has completed on time and within budget with all the features and functions as specified. Meanwhile, challenged project is identified as the late completed, some money was wasted and it lacked some of the qualities and functions that were stated initially.

Impaired or failed project is recognized as the project that was cancelled or abandoned, therefore all the investment of the project was lost.

The main contribution of this paper is to identify the critical success factors (CSFs) for IT projects and find out the score ranking for these CSFs. Systematic literature review (SLR) and online survey was conducted with the experience of 103 developers in eight (8) IT companies to achieve this contribution.

The paper is organized as follows: Section I is the introduction, the related works is presented in Section II including the definitions of IT projects, IT project CSFs according to the literature. Section III presents the methodology and the results are discussed in Section IV, while Section V contains the discussion of the study. Finally, section VI presents the conclusion.

II. RELATED WORKS

Failure rates of IT projects was introduced in [2], where they present fourteen (14) hypotheses on the reasons for IT project failure. These hypotheses will be assessed in a survey on IT project managers conducted by the researchers. Five of the presented hypotheses as listed below, is concerned with different parts of "failures" which is derived from the four management disciplines organizing, planning, controlling and leading which is important for this paper:

- Project failure has a positive relationship with poor control.
- Poor estimation has a positive relationship with the project failure.
- A positive relationship exists between poor monitoring and project failure.
- Technology newness has a positive relationship with project failure.
- There is a positive relationship between the degree of lack of senior management sponsorship and project failure.

IT management has been studied in [3]. In this paper, factors linked to failure have been identified from a survey of 92 respondents. These factors include:

- Timeline minimization.
- Inadequate analysis of project risk.
- Incorrect assumptions with regards to risk analysis.
- Top down style management.
- Poor internal communication.
- Bad software choice.

A taxonomy and measurement of IT complexity development projects was developed by [4]. A survey on IT development projects in North America has evaluated the taxonomy. Lastly, the result of the survey was evaluated based on to its correlation with the performance measures of

four projects; (a) project delivery time, (b) cost, (c) system functionality and (d) end-user satisfaction. The taxonomy identified by [4] is made up of both structural/dynamic aspects and organizational/technological of IT development projects, which includes the following factors:

- i. There was no direct control over projects resources by the project manager.
- ii. Users did not give sufficient information.
- iii. There was shortage of staff for the Project.
- iv. Project personnel did not have the needed knowledge/skills.
- v. There was insufficient support from top management.
- vi. There was a significant integration of the project with other systems.
- vii. Many technology platforms were used in the project.
- viii. IT development projects involves rapid changes in technology.
- ix. Multiple software environments were involved in the project.
- x. There is difficulty in estimating and managing technical specifications.

According to [5], project management are related to the common causes of IT project failure. The following causes were identified based on research by the Coverdale Organization and observations from the Virtual Case File:

- i. Lack of clear objectives and goals.
- ii. Changing objectives during the project.
- iii. Unrealistic estimation of resources and time.
- iv. Lack of executive support.
- v. Lack of communication and failure to act as a team.
- vi. Inappropriate skills.

Another approach for CSFs of IT projects was presented by [6]. The literature review was extended using five case studies of IT projects executed at a European telecommunications company. Results from this study revealed that successful projects have a strong relationship with efforts to understand customers' business and their needs. The following Specific important factors were identified:

- i. Poor top management support.
- ii. Lack of communication.
- iii. Lateness in identification of stakeholders.

The Standish Group CHAOS report serves as an essential reference for this paper and most of the described works. An often cited summary of the CHAOS top ten factors [1] includes the following Critical Success Factors (CSFs):

- i. Committed and motivated team.
- ii. Executive support.
- iii. Clear business objectives.
- iv. Project management expertise.
- v. Skilled resources.
- vi. Tools and infrastructure.

To achieve the objectives of the project, supportive top management is important. The overall project outcome will be affected if the top management does not give, adequate responsibility or authority to the project manager or back the suggestion of the project manager [7].

Another problem can be the presence of a wrong project manager. If the project manager does not possess the skills, experience or personality to manage the project, he won't be able to confront conflicts, or adjust to the modern dynamic workplace. In order to direct other project team members to successfully complete the project, the project manager must possess some important skills. Therefore just having a project

manager is not so important but he has to be skillful [8].

The problem of ignoring systematic nature of projects may also exist. For example, software, hardware resources, and facilities are seen independently without regard to their relationship with the overall project objectives. Also, another factor is misusing management methods. In this case the problem lies with the project manager, project team or method [7].

It is very important for the project team formed to possess the basic skills in order to provide a highly capable work force for the project as well as for the organization as a whole [8].

As a result of poor communication, inadequate definition of project, inadequate user participation, bad time and resource estimation, and numerous changes done during the execution phase, planning failure and problems of controlling may occur [7].

According to a survey conducted on Information Systems (IS) projects by [8], seven key factors have been identified which are; Competent team members, Clearly defined goals, Support of top management, Sufficient project resources, Competent project manager and Internal communication.

Internal communication is the major answer to "Why IT project fail? Therefore to achieve a successful IT project, it is important to build an honest, communication to achieve IT project success [9].

Failure of IT projects can be as a result of lack of communication, because communication is linked to how the organizational culture of the company is established and the interaction in the organization. However, among all the companies interviewed, the human factor wasn't clearly considered through the cultural aspect as a determinant of success and failure [10-12].

An online survey as well as a literature survey of the important IT project risk factors had been carried out by [13]. According to the proposed study eight main success factors are considered if proper attention is given by any IT company to the factors that have percentage of 50 to 75 then main loss that may occur in the software project can be managed. It is clearly stated in the study, that the most important success factor is scope change management and project managers have to pay attention to it. Poor internal communication is also one of the factors that should be focused on.

One of the major important Success Factors (CSFs) of IT projects is a motivated and committed team. Therefore, it is important for the team to be committed and motivated in order to achieve success [1, 14-21].

III. METHODOLOGY

This study undertakes a systematic literature review (SLR) based on original guidelines as proposed by Kitchenham [22]. The SLR begins with planning the review, followed by identifying the research, next is selecting the papers, and lastly data extraction as revealed in Figure 2. Systematic literature review was carried out in order to answer the first research question (RQ) below:

RQ1: What are the IT projects Critical Success Factors (CSFs)?

Also, the researchers carried out a survey to answer the second research question (RQ) below:

RQ2: what are the ranking of these Critical Success Factors (CSFs)?

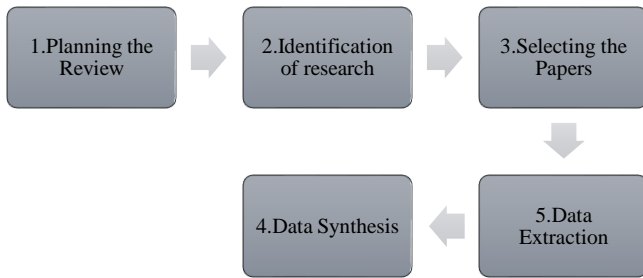


Figure 2: Research methodology

A. Systematic Literature Review (SLR)

In this study, a systematic literature review (SLR) based on original guidelines as proposed by Kitchenham was carried out. The SLR begins with planning the review, identifying the research, selecting the papers, extracting the data as revealed in Figure 2. To answer the first research question, a systematic literature review was carried out:

RQ1: What are the IT projects Critical Success Factors (CSFs)?

1) Planning the review

Firstly, a protocol for the systematic literature review to specify our research strategy is provided. The strategy will be used in this study to search for particular terms and resources from specific journals, databases, electronic and conference books.

2) Identification of research

Identification of specific terms and the keywords related to the topic of the research is the first step in this study. To search for important papers regarding IT projects and IT projects Critical Success Factors (CSFs), general keywords were used. This is done in order to get relevant published papers from conferences, archival journals, and electronic books from five electronic databases, Emerald, IEEE, IGI, Elsevier's, Scopus.

3) Selecting the papers

To select papers from published papers, conferences and archival journals, two methods were used. The first list is based on studying the abstract and conclusion of the papers and the last list is based on reading the whole paper paying attention to details. The first list is made up of 38 papers which are important to this study. However, after reading and reviewing the 38 papers, only 28 papers were prioritized for this paper. The remaining 10 papers were discarded as there was no useful information found in them.

4) Data extraction

Data was derived from papers with useful information on IT projects and the IT projects Critical Success Factors (CSFs).

5) Data synthesis

In order to extensively cover the literature on IT projects, specific and related papers were selected by the researchers including the definitions of CSFs for IT projects. The work was divided into two parts, the first part is concerned with getting information on the definition, concepts, of IT projects and the second part is concerned with Critical Success Factors (CSFs) for IT projects.

B. Data Collection

A number of 140 of questionnaires were distributed online among IT organizations. The questionnaire was made up of six closed-ended sections (5-point Likert Scale) with 61 questions in total. The first two parts which contains 15 questions are related to our study. To analyze the data in this study, Static Package for Social Sciences (SPSS), version 22 was used to analyze.

IV. RESULTS

A. Results of Systematic Literature Review

From fourteen (14) papers, the first research question was answered as IT projects Critical Success Factors (CSFs). Table 1 presents the definition of CSFs. Also, Figure 3 shows the IT Project Critical Success Factors (CSFs). Table 2 shows IT Project Critical Success Factors (CSFs) from Systematic Literature Review (SLR) with sources.

Table 1
The Critical Success Factors (CSFs)

Critical Success Factors (CSFs)	Definitions	Sources
Committed and Motivated Team	It is concerned with the interest the team has in the IT project and how the project can be completed within good time, cost, quality, and budget.	[21]
Internal communication	To realize the allocation of project roles and relationship, communication is very important. it ensures that the project takes place in an opened, transparent environment. It also allows stakeholders get the unanimous understanding on the objectives of the project and take their responsibility.	[9, 13, 23]
Use of Tools and Infrastructures	Refers to hardware and software tools.	[24]
Goal and Objectives	The aim of the project is formulated and successfully communicated clearly.	[24, 25]
Skilled Project Managers	The ability to adjust the leadership pattern depending on the situation and the group.	[24, 26]
Skilled Teams	The team needs relevant knowledge and skills to perform all tasks in the project.	[24, 26]
Risk Analysis	Includes established routines to discover and take preventive action to avoid them.	[24, 25]
Project Monitoring	Includes active use and continuous updates of project plan and actions taken immediately.	[24, 25]
Good Estimation	project resources estimation is realistic and measurable.	[24, 25]



Figure 3: IT Projects Critical Success Factors (CSFs)

Table 2
IT Projects (CSFs) from SLR

Critical Success Factors (CSFs)	Sources
Committed and Motivated Team	[1, 14-21]
Internal communication	[3-14]
Use of Tools and Infrastructures	[1-5, 7, 8]
Goal and Objectives	[1, 5, 8]
Skilled Project Managers	[1-8]
Skilled Teams	[1, 4, 8]
Risk Analysis	[1, 3, 15, 21]
Project Monitoring	[1, 2, 21]
Good Estimation	[2, 3, 5, 6]

B. Results of Confirmation Study

1) Reliability and Validity Test

Validity shows the ability of an instrument to measure what it claims to and reliability is how reliable and consistent a survey is. To ensure the validity, the questionnaire was checked and reviewed by two experts in English language and questionnaire design. Their suggestions and comments were taken into account and the questionnaire was revised. Then a pilot study was conducted. Therefore, a total of 40 copies of questionnaire were sent via online survey (survey monkey) and 25 respondents completed the questionnaire. The results were analyzed by SPSS 22. The reliability test was also carried out on the data from the pilot study for the other parts of the questionnaire which is not our focus in this study.

2) Respondents' Characteristics

After removing the defective case and checking the outliers, the final sample was 103. 74.76% of respondents were male. The majority of respondents were 66.02% from 26-35 years. 56.31% of respondents were Asian. Since the scope of this study is IT companies, 95.10% of respondents were from IT industry. 87.13% of respondents have undergraduate certificate. 71.29% of respondents are IT professional, for example software developers. Around 38.83% of samples have work experience from 6-10 years.

Finally, 60.78% of the IT companies are private. A more detail information regarding the demographic data of respondents is shown in Table 3.

3) Ranking of Success IT Projects

The rank of IT projects Critical Success Factors (CSFs) according to their propriety level as shown in Table 4. The highest level of Critical Success Factors (CSFs) for IT projects is a committed and motivated team. On the other hand, the lowest level of Critical Success Factors (CSFs) for IT projects is project monitoring.

V. DISCUSSION

After reviewing literature on the CSFs of IT projects, some factors related to their success were identified as shown in Figure 4. These factors were investigated; committed and motivated team, use of tools and infrastructure, internal communication, goals and estimation, good estimation, skilled teams, project monitoring, and risk analysis. Also, the findings revealed that for IT project success, Committed and Motivated team is the highest level of factors. On the other hand, the lowest level of factors for IT project success is project monitoring.

Table 3
Respondents Demographic

Variables	Frequency	Percent
Gender		
Female	26	25.24
Male	77	74.76
Age		
Less than 26	14	13.59
26-35	68	66.02
36-45	19	18.45
46-55	2	1.94
Nationality		
Asian	58	56.31
Middle East	40	38.83
European	5	4.85
Industry		
Computer/IT	97	95.10
Telecommunication	5	4.90
Education level		
Undergraduate	88	87.13
Postgraduate	13	12.87
Qualification		
IT Project Manager	15	14.85
System Analyst	14	13.86
IT Professional	72	71.29
Work experience		
Less than one year	2	1.94
1-5 years	37	35.92
6-10 years	40	38.83
11-15 years	19	18.45
16-20	4	3.88
More than 20 years	1	0.97
Organization type		
Semi government	40	39.22
Private	62	60.78

Table 4
Ranking of Critical Success Factors (CSFs) for IT Projects

Rank	CSFs	Frequency	Percent
1	Committed and motivated team	68	66.0
2	Internal communication	54.4	56
3	Use of Tools and Infrastructures	53.4	55
4	Good Estimation	39.8	41
5	Goal and Objectives	51.5	53
6	Skilled Project Manager	42.7	44
7	Skilled Teams	36.9	38
8	Risk Analysis	35.9	37
9	Project Monitoring	15.5	16

Ranking of Critical Success Factors (CSFs) for IT Projects

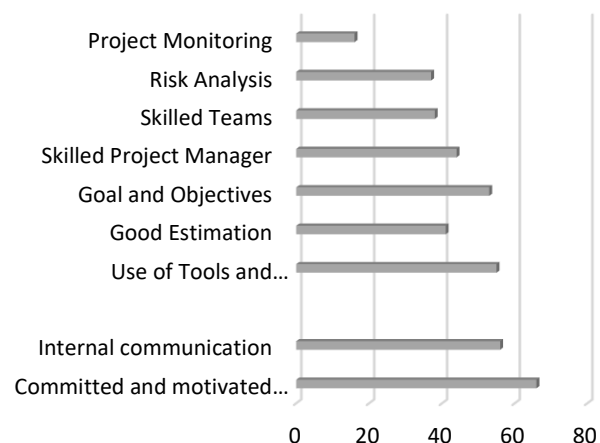


Figure 4: Ranking of Critical Success Factors (CSFs) for IT Projects

VI. CONCLUSION

This literature on IT projects identified the factors related to the success of IT project such as: committed and motivated team, internal communication, goals and objectives, use of tools and infrastructures, risk analysis, good estimation, skilled teams, and, lastly, project monitoring. To rank these factors, an online survey was carried out. According to the ranking list; committed and motivated team is the first and project monitoring is the last, see Figure 4. Research should be further carried out in the future to investigate more factors related to IT projects success.

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