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# **Current trends analysis and prioritization of success factors: A systematic literature review of ICT projects**

## **Abstract**

**Purpose:** The purpose of this study is to investigate the current literature that has explored project success in information and communication technology (ICT) sector.

**Design/ Methodology/ Approach:** The literature search was carried out for related articles in three databases: the Web of Science, Scopus, and Ebscohost. Using a systematic literature review (SLR) methodology, 75 related articles were sorted out. Furthermore, the methods of frequency and content analysis were used to identify, categorize, and arranged critical success factors of ICT projects based on their importance, interrelation, and cultural regions.

**Findings:** The findings in this study revealed that interest in researching success in ICT projects has increased significantly during the last five years. Through reviewing the selected articles, twenty-five critical success factors (CSF) were identified. User participation, stakeholder relationship, project manager emotional intelligence, communication skills, and leadership skills, and top management support in the project emerged as the most important factors for ICT projects. Furthermore, we found that each regional group gives different level of importance to different critical success factors.

**Practical implications:** This study gives the opportunity to practitioners to control the highest value critical success factors to increase the success rate of ICT projects carried out in different cultural regions.

**Originality:** As the first study of its type, critical success factors were divided for different cultural regional groups. This paper further explained that certain critical success factors have different levels of importance in different culture regions. This study suggests that regional culture needs consideration during the evaluation of critical success factors.

**Key word:** Project success, project success criteria, critical success factors, ICT project

## **1 Introduction**

Information and communication technology (ICT) projects are becoming more complicated and difficult due to increasing complexities and uncertainties in budget, user requirements, and technology. This suggests the need to study further the subject of project success of ICT projects. Therefore, a comprehensive review of the previous literature on project success is required to explore and evaluate all discussed perspectives and approaches systematically. The first step in studying project success in ICT sectors is to establish what project success means. The definition of project success developed along with growing

interest in project management practices. Initially, project success was defined as a project completed within allocated cost, time and satisfaction of quality requirements (Atkinson, 1999).

Furthermore, some researchers have explained project success by dividing it in two parts; as project product success, which focuses on end products, and project management success which based on the components of iron triangle (i.e., time, cost, and quality) (Baccarini, 1999). The satisfaction of project sponsors and achievement of the strategic objectives were added as additional factors to the definition of project success (Ika, 2009). Later on, researchers defined project success more comprehensively as a project completed within scheduled time, estimated cost and identified scope, fully satisfying sponsor and customer demands (Schwalbe, 2010). In result of continuous interest from the researchers in the subject, contemporary definition of project success has become a multi-dimensional framework, which have the elements of iron triangle (cost, time, and quality), stakeholders' satisfaction (customer, and project sponsors) as well as achievement of the expected project functional results (Joslin and Müller, 2015). In other words , studies on project success focusing on either project criteria to judge the project success or investigating success factors of the project (Ika, 2009).

Canadian Oxford Dictionary (1998) has defined criteria as a principle or rule on which things or events are judged and factor is a circumstance which contributes to result (Barber, 1998). Thus project success criteria may be define as a set of standards or rules used to judge or determine project success,” and critical success factors as the facts or circumstances that influence project results or project success (Ika, 2009). We further explain the process of evolution and development in the studies investigated success factors from various approaches.

Project success factors initially reported by Rubin and Sealing in 1967, have been used since then repeatedly in project management studies (Serrador, 2013). One well-known and applied list of critical success factors was developed in 1988 (Pinto and Slevin, 1988). Recently, the subject received more attraction from across the world. Researchers investigated different sets of critical success factors (Stankovic et al., 2013), categorized (Ahimbisibwe et al., 2015), prioritized (Yaghoobi, 2018), and modeled these factors (Sudhakar, 2012) to improve the success rate of projects. Different methodologies such as quantitative approaches (Chow and Cao, 2008, Stankovic et al., 2013), qualitative approaches (Omar et al., 2016, Ismail and Razali, 2015), multi-methods and holistic strategies (Remus and Wiener, 2010), and Bayesian decision-support models, (Gingnell et al., 2014) were used to investigate and quantify CSFs to avoid the associated risks and improve the project success rate. The review of multiple studies including the current study shows that interest of researchers has increased significantly in the subject of project success in ICT sector (Ika, 2009, Warren, 2016). In spite of growing researchers' interest, the success rate in ICT projects is alarmingly and consistently low since 1995 (Johnson, 2018, Group, 1995, Group, 2014, group, 2016).

ICT projects have serious challenges related to cost overruns, late deliveries, and cancellation of projects before their completion. A project management global survey performed by KPMG in 2005 shown that around 33% of information service projects were not finished on time, and around 31% other projects suffered from cost overruns (Global, 2005). The Standish Group similarly reported that only 33% of projects were completed successfully, while project failure rates were above 16% over the last two decades. Further, information technology projects have average overruns of around 27% and a source of a large number of black swan projects (Johnson, 2018). ICT project success rates are much lower than projects of other sectors. Due to rapid technology advancement and globalization, the life cycles of products/projects have become shorter with the passage of time (Winter et al., 2000). This has made the issues of overruns and failure more challenging, broader and complex in the ICT sector. Other possible reasons for poor performance of ICT projects are its relative new and in evolutionary stage and lack of broadly accepted techniques to measures the output of ICT projects. For example, **projects of other sectors such as construction have well defined guidelines and procedure and nature of ICT projects is vague in term of its standard operation procedures. In addition, the availability of relevant experts is another factor for the failure of ICT projects** (Dekkers and Forselius, 2007, Wright, 2000).

In order to improve success rate of ICT projects, researchers from different countries have identified multiple critical success factors. In spite of the multi-causality and multi-dimensionality of these factors, it is possible to gather and group the factors that have similar meanings into so-called critical success factors (CSF). We believe if these CSFs are considered properly, during various project phases such as project design, planning and execution, project success rate can be improved considerably. Using a systematic literature review (SLR) process, we have identified several critical success factors of ICT projects in different regions and suggested practical recommendations to the practitioners. SLR is used to identify the recent trend and grade of research regarding a particular phenomenon of interest (Chen and Babar, 2011) by identifying, evaluating, and interpreting all the available relevant research using predefined search strategy, inclusion and exclusion criteria (Keele, 2007). It enhances the quality of data collection by using systematic manner and reduces the duplication of error as compared with the ordinary literature review (Magdaleno et al., 2012). The findings are more reliable, fair, and less bias than ordinary literature. The main rationale for using SLR is the fairness and reliability in synthesis the existing work. It increases the scientific values for its findings (Khan and Khan, 2013). However, the well-defined method makes it less bias than ordinary literature review, although it needs extra effort to protect from the publication bias of primary studies. Another major disadvantage of the SLR is that they need more effort than traditional literature reviews, but offered in-depth research in the topic of interest (Keele, 2007).

It was found from the previous literature that the subject of project success received increased interest in last few years. Therefore, it was mandatory to analyze the trends, find the reasons of this rapid increase and identify the new emerging themes of recent research. However, arranging project success factors from cultural perspectives is the key interest of this study. Culture is shared values of a community and an important issue for organizations (Kivrak et al., 2009). Therefore, its influence on project success factors needs to be assessed comprehensively. Culture is a joint program for the software of the mind (Hofstede, 2001), which frames individuals and societies. Holden (2002) calls it varieties of common knowledge (Holden, 2002). Trompenaars (1993) has identified seven dimensions of culture including attitudes to time, and attitudes to the environment, collectivism-individualism, neutral-emotional, achievement-aspiration, universalism-particularism, diffuse-specific (Trompenaars, 1993). Based on a set of common traits and dimensions, R. D. Lewis (2005) categorized World cultures into three classes as linear-active, multi-active, and reactive (Lewis, 2005).

The impact of national culture on project success has been stated previously in different studies. Murray-Webster and Simon (2004) found a strong effect of culture differences on project success in their study of Russian/British joint venture company (Murray-Webster and Simon, 2004). Researchers have explored impact of cultural dynamics on the process and outcomes of engineering projects (Tukiainen et al., 2003) and management of large scale science projects (Tukiainen et al., 2003). Bredillet et al., (2010) have compared all country's GDP and cultures to see their effect on project success. De Bony, J. (2010) have explored the effect of national culture on project management with a Dutch- French case study (De Bony, 2010). Moreover, influence of national culture on the perception of project success has also addressed in the literature (Mir and Pinnington, 2014). Another group of researchers have discussed the influence of national culture over organizational culture (Gulev, 2009) and the reciprocated opposition by organizations against the national culture (Nelson and Gopalan, 2003).

However, to the best of our knowledge, no one has arranged CSFs in ICT projects based on regional cultures. Therefore, this is the first research to put and re-arrange these critical success factors on this basis. We consider Lewis's categorization for this study to assess and organize project success factors from cultural perspectives. It is a rational categorization of the countries based on common traits of individuals. Moreover, it is a very simple and easy context to understand the importance of each CSF in different regions. Previous literature reviewed studies showing general trend of success/failure factors in the world or have compared CSFs of few countries. In this study, we have shown the general trend of success factors in the globe as well as trends in different cultural regions by using Lewis's categorization. It is as comprehensive to cover the whole world as well as the regional cultures. Additionally, it can be used as a pool to see the criticality of the identified critical success factors in each individual country. It is more elaborative, specific and easy to understand context for evaluating the importance of CSFs. The primary

purpose of this review study is to investigate and analyze the trends and distribution of literature and identify CSFs that influence ICT projects carried out in different regions. We expect the result of this study to provide valuable and specific inputs to the practitioners performing projects in different regions to execute and manage projects well and reliably deliver the expected results.

This paper is organized as follows. The paper draws on evidence from literature about project success. The next section discusses the methodologies for systematic literature review, frequency analysis and content analysis. In third and fourth section, the analyses of current trends and interest in the literature are presented. A detailed list of critical success factors with its frequency analysis, its arrangement based on different cultural regions, and its categorization are found in the fifth section. In the last sections, we have discussed the findings and concluded the study with its application, both for practitioners and researchers, and put forward recommendations for future directions.

## **2 Research Methodology**

A systematic literature review (SLR) process has been conducted for searching and reviewing literature consistent to previous studies such as (Tranfield et al., 2003) and (Gupta et al., 2019). This method may suffer of publication bias (Keele, 2007). To deal with the publication bias in SLR, predefined inclusion/exclusion criteria were used to scanned all grey literature and conference paper. Therefore, only peer-reviewed articles were used for this study. Further, two researchers reviewed the selected articles independently to control the biasness. Inter-rater reliability method was used to identify any influence of subjectivity and biasness on the researchers' opinions.

The flow diagram of the SLR process is shown in Figure 1. In the second phase of the study, we used methods of content analysis and frequency analysis for data extraction and identification of critical success factors in the selected literature. Each method is explained in the following sub-sections in detail.

### **2.1 Systematic Literature Review (SLR)**

SLR process is a five phase systematic methodology for sorting out and reviewing articles from a large pool of publications. In this study, we confine our search for the required articles to the three well-known databases: Web of Science, Scopus and Ebscohost. The systematic literature review contains the following phases.

### 2.1.1 *Establishing of research objectives and conceptual boundaries*

A systematic literature review process starts by establishing the research objectives and defining project success in detail.

### 2.1.2 *Inclusion criteria*

The literature search was conducted for related articles in Scopus, Web of Science, and Ebscohost without any time span to collect as many related articles as possible. We used the combination of the following search terms to identify all the available articles regarding ICT projects success:

- ICT projects success
- Information and communications technology project success
- IT projects success
- Information technology projects success
- IS projects success
- Information service projects success
- Software development projects success
- Software projects success

### 2.1.3 *Exclusion criteria*

Through the above processes, we downloaded 210 articles from 85 international academic journals published from 1990 to 2020. The exclusion criteria were applied for further sorting out the selected articles and it was carried out in four phases. Firstly, we removed all conference papers, posters, company reports, books, and white papers from the search results. Secondly, we removed the articles written in languages other than English. Thirdly, we removed duplicate articles by arranging them in Mendeley. Through these three steps, 116 articles were deemed relevant. In certain cases, because of the poor abstract writing, it is difficult to identify the purpose, methodology, findings and conclusion of the study by only reading abstract of the study (Thorpe et al., 2005). Therefore, in step four of the exclusive criteria, we read the abstract, introduction, and conclusion of 116 articles, and divided them in four categories: A, B, C and D according to their relevancy (Nolan and Garavan, 2016). It is important to mention that the relevance assessment of the selected articles to categorize them as A, B, C, and D was relative, to the extent that our judgements were focused on factors contained within the scope of the review. The articles, which were relevant as per the inclusive criteria and discusses the success factors of ICT projects were put in category A. The studies, which were deemed relevant but after reading their abstract, introduction, and conclusion, one cannot decide about their relevancy were put in category “B”. The relevancy of category “B” is not clear a priori. The

articles where the nature of research work were not clear labeled as category “C”. The remaining articles, which were seem relevant initially but were out of the scope of the review were categorized as “D”. In this study, category A had 75 completely relevant articles, while category B had nine articles whose relevancy were unclear. Similarly, category C had eighteen less than relevant articles, and D had fourteen irrelevant articles. Finally, we excluded articles in all categories except category A. Through this systematic process, we finalized 75 articles of category A for this study.

#### 2.1.4 *Validation of the results*

The final phase of the systematic literature review (SLR) is validation by cross comparison of two researcher’s opinions about the search results. We used an inter-rater reliability method to identify any influence of subjectivity and biasness on the researchers’ opinions. Two researchers reviewed the selected articles independently. The results of both researchers were compared with one another, and no significant conflicts were found among their opinions. Striking differences of opinion were observed in only four articles, which were sent to a third researcher to resolve the differences.

## 2.2 **Methods of data extraction and analysis**

After the SLR selection of articles, we organized all articles in Mendeley and noted the key information from each such as author/authors’ name, academic journal, publishing year and country, research methodologies, and success factors in an Excel spreadsheet. Each article was reviewed carefully to compile project success factors, which had been identified in the selected literature using content analysis and frequency analysis methods as discussed in the following sub-sections.

### 2.2.1 *Content analysis*

Content analysis was used in this study to find all factors stated by authors either explicitly or inexplicitly. The identification of the discussed factors was not possible by just counting the occurrence of each factor using simple frequency analysis. For instance, researchers use various terms for describing the same factors, so, through content analysis, all factors having similar meanings were presented as the same phrase. Content analysis is a qualitative method consists of the following main steps:

1. Selection of text
2. Identification and condensation of Meaning units
3. Labeling of condensed meaning units by formulating codes
4. Grouping together the similar codes

First, a set of 75 articles were selected using criteria of SLR method as has discussed in section 2. In initial step, we reviewed the selected articles to gain a general understanding of each article. Then, identified lower level of abstractions known as “units of meaning”. These units were ICT success factors



mentioned by different researchers. In this case, the meaning units were so compact that no need of condensation were required. A total of 160 meaning units (success factors) were gathered from the selected set of articles. In the next steps, codes were developed that are the concise labels of the meaning units. While doing this, need to ensure that the cores meaning of each meaning unit is retained. All the meaning units were presented by 26 codes. We refer to each of these codes as critical success factors of ICT projects in the following sections. It is important to mention here that content analysis is a flexible reflective process, which is not one-time event. It is a continuous process of repeating, editing, and adjusting until codes properly match the core meanings of the meaning units. In the next step, categories were made by grouping together all the related codes. Here, all the codes were grouped in 7 categories namely as, Project management factors, Project manager factors, environment factors, organizational factors, project team factors, project factors.

For example, project team's expertise, IT capability of project team, higher caliber team, project team competencies were considered as meaning units, which were coded as “team members’ expertise”. Then, the similar codes with team members’ expertise such as team members’ commitment and motivation, team members’ coordination and communication, appropriate project team building and team member experience were gathered in the category of project team factor. The same process was repeated for all factors. The use of this method is in line with the approach used by (Nasir and Sahibuddin, 2011) in their studies for identifying CSFs for project success.

### **2.2.2 Frequency analysis**

Frequency analysis is an important method to measure the frequency or the number of occurrences of certain events and their central tendency. In this study, we have used frequency analysis to identify the number of occurrences of each success factors in the selected literature. Based on the measured frequency, we ranked all factors in tabulated form. The articles, which have the highest frequency, are ranked high in the table. Finally, the importance and criticality of each factor was analyzed and discussed. The use of frequency analysis approach for identification of success factors is consistent with multiple previous studies such as (Wateridge, 1998) and (Fortune and White, 2006).

## **2.3 Critical success factors and regional cultures**

World cultures were categorized by R. D. Lewis (2005) into three classes as linear-active, multi-active, and reactive based on their traits (Lewis, 2005). The linear-active category consists of personnel who are punctual, patient, introvert, and quiet. Linear-active individuals are private, unemotional, and task-oriented. They mind their own business and plan everything ahead. Germans, Swiss, Danes, Swedes, Dutch, Americans, and Australians mainly follow a linear-active culture. The multi-active category

encompasses individuals who are unpunctual, impatient, extroverted, and talkative. They are the opposite of those in the first category. Latin Americans, Arabs, south Asians, and Africans countries were grouped as multi-active cultures. Multi-active cultures have traits that are opposite those of linear-active cultures. The third group in the culture triad is the reactive group. This group consists of people who are punctual, patient, introverted, and silent. They combine the characteristics of linear-active and multi-active in response to the environment. Japanese, Chinese, Koreans, the people of Hong Kong (China), Singaporeans, Vietnamese, Malaysians, Indonesians, and Cambodians follow a reactive culture (Lewis, 2005). This sample has total 75 articles from 33 countries across the world, which were grouped according to their regional cultures. The sample consists of 18 linear-active cultures, 08 reactive, and only 07 multi-active culture countries. Frequency analysis method were applied to each regional culture group to identify the level of importance of critical success factors in each group separately. Content analysis were carried out once for all the considered articles, so no need to repeat it again for individual regional groups. That information can easily be used here.

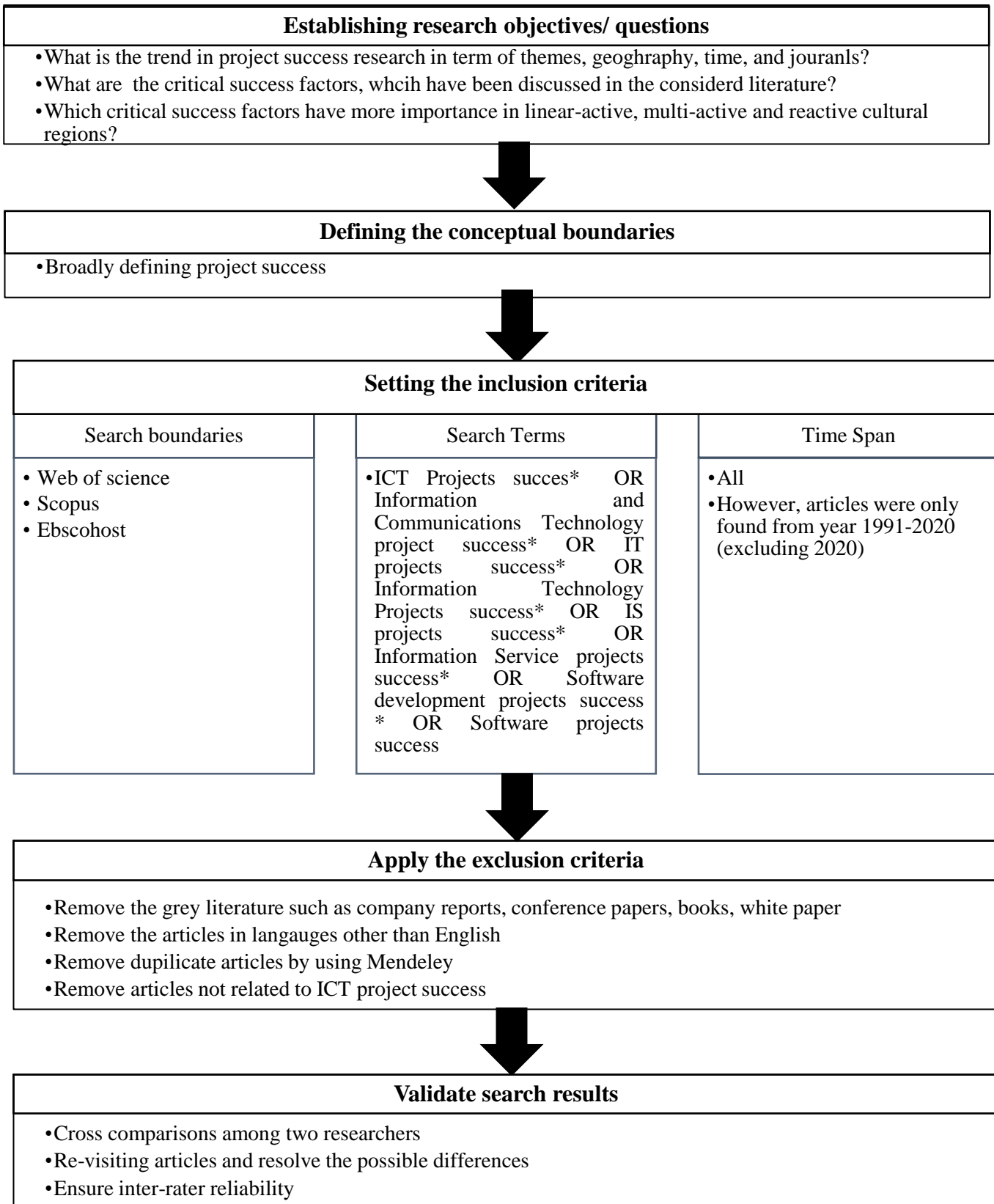


Figure 1. Flow diagram for systematic review process

### 3 Literature analyses: Trends and Themes

#### 3.1 Annual Research trend

This review study is based on a sample of 75 articles published up to 2020 (excluding 2020) across the globe. The first article in the selected literature on project success was published in 1991 by M. Deutsch in IEEE Transactions on Engineering Management (Deutsch, 1991). The subject of project success attracted researchers from 2006 onwards. As shown in **Error! Reference source not found.**, we found only nine relevant articles in the selected sample published before 2006. The average number of articles increased from 0.6 per year in 1991-2005 to 3.3 articles per year in 2006-2014 and to 7.2 articles per year in 2015-2020. Around 50% of the publications in our dataset were published in the last five years. This shows an increasing interest of researchers in investigating project success in ICT sectors.

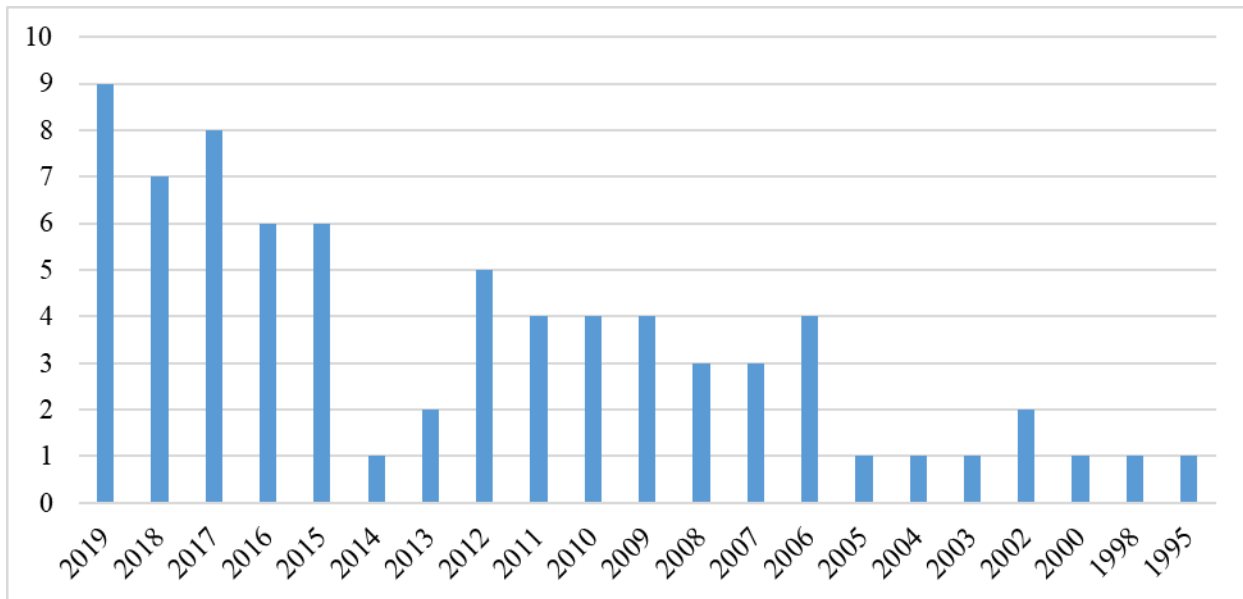


Figure 2. Annual publications on project success factors from 1990-2020

#### 3.2 Distribution of publication amongst leading journal

The research focusing on the subject of project success in ICT projects has been published in 49 international journals worldwide. Amongst these journals, international journal of project management (11), journal of systems and software (6), international journal of managing projects in business (5), journal of enterprise information management (3), and project management journal (3) are the top five types of journals as shown in *Figure 3*. The rest of the articles have been published in 44 various journals.

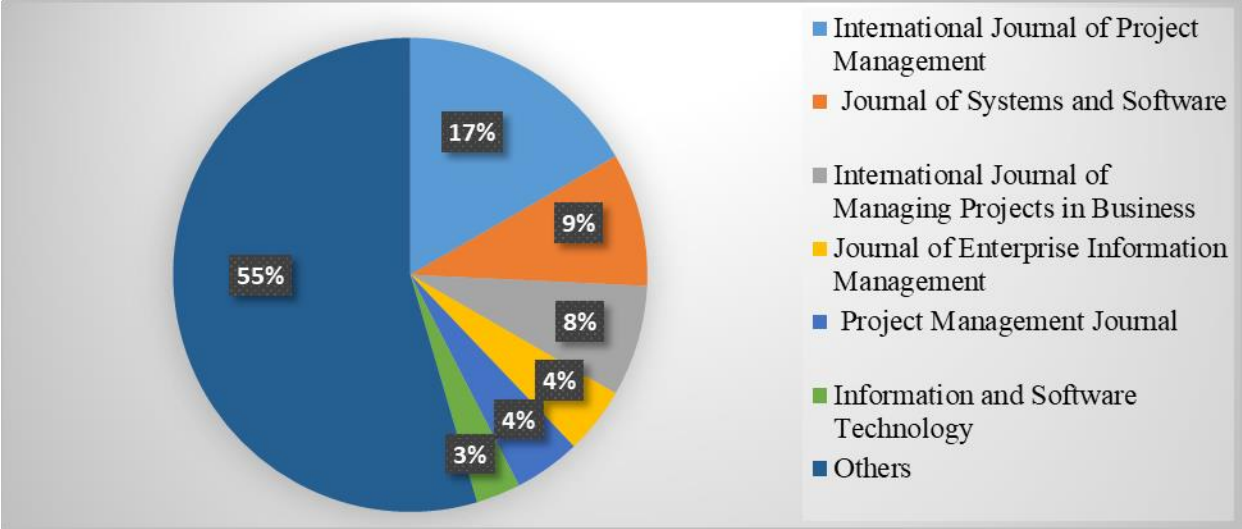


Figure 3: Journals-wise distribution of selected publications

### 3.3 Geographic spread in the sample

The published articles have a huge geographic spread. The analysis revealed that the selected studies have been performed in 33 countries across the globe. The USA has the highest number followed by United Kingdom and Germany. According to the region-wise distribution of the authors, Europe with 40% of total articles dominates the sample, with substantial numbers from Asia (28%), and the USA (17%), where Africa has just 3% of total selected articles as given in *Figure 4*.

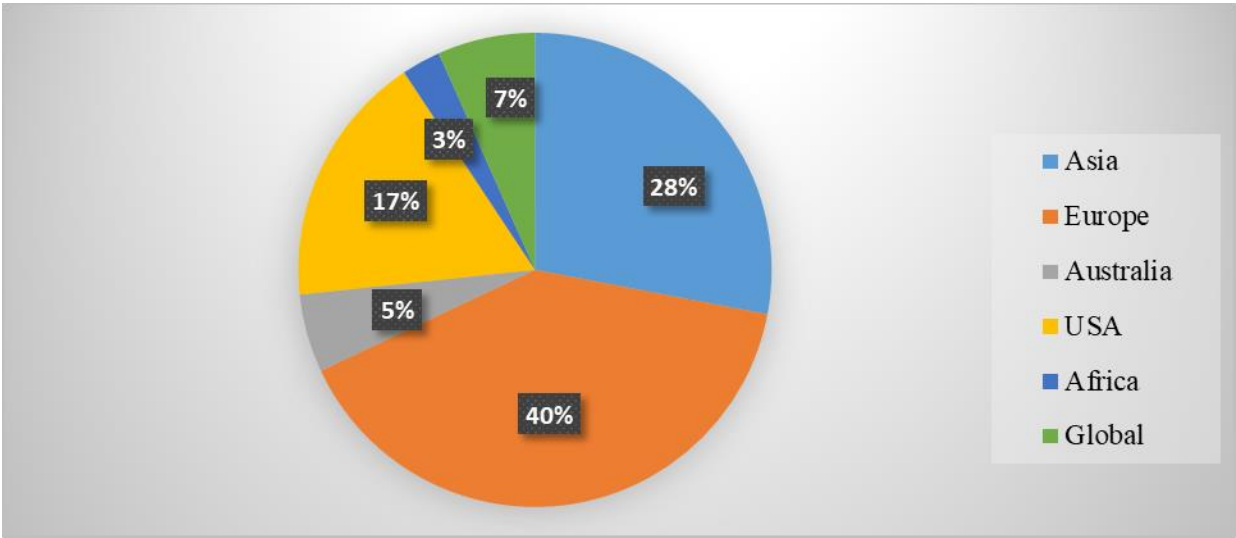


Figure 4: Region-wise distribution of selected publications from 1990-2020

The in-depth analyses of the sample show that a rapid increase occurred in Asia in the number of related articles in the last five years. As shown in *Figure 5*, 49% of the total articles in the last five years were published in Asia. It is because of the countries like India, Indonesia, Malaysia, and Pakistan have developed interest in ICT fields and, as well, in the research, which leads to rapid increase in the number of relevant research publications in Asia.

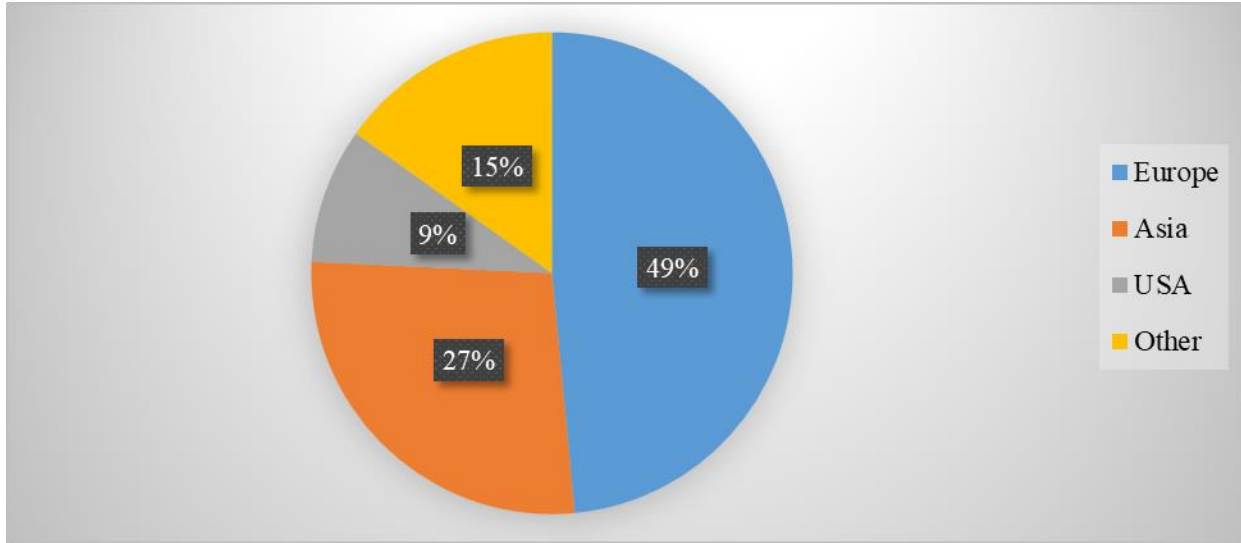


Figure 5. Region-wise distribution of selected publications from 2015-2020

### 3.4 Research methods

Researchers have used most of the common methodological approaches for investigation project success in ICT sector. We classified the selected articles under the different methodological approaches they used.

As shown in *Figure 6*

Figure 6. Methods used in selected publications

, the most popular methodologies used in these studies are survey/ questionnaires and interviews. Among 75 selected articles, 31 articles used survey methodology, followed by interviews (15), which covered the largest portion of the sample. Further, the sample has 12 articles which has linked project management literature with management theories such as institutional theory, organizational theories, through theoretical studies. The sample also consists of eight literature reviews and eight studies in which mixed method was used. The review of the articles further shows that researchers have relied generally on project managers for information and their inputs about project success. However, they also recorded and investigated the opinions of top management, project directors, senior managers, functional managers, supervisors, clerical staff, project sponsors, practitioners and end users for knowledge production on project success in multiple studies.

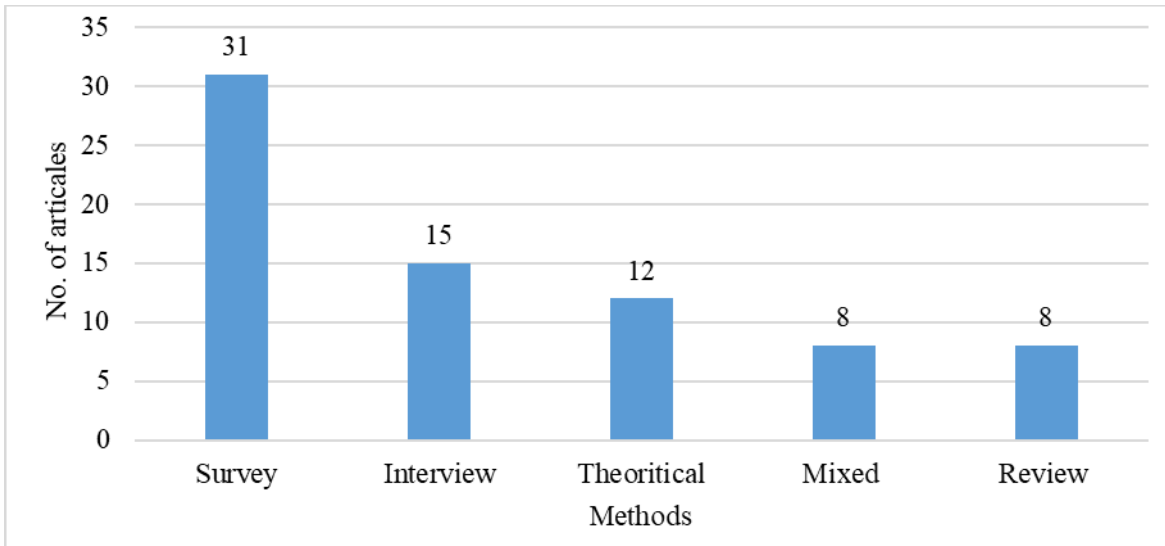


Figure 6. Methods used in selected publications

#### 4 Current Research Interests

In this section, we have discussed about the prevailing themes and sub-themes in the selected studies related to project success of ICT sector. As we discussed in the earlier section, project success studies are related to project success criteria or investigation of project success factors from different perspectives such as stakeholders, or project life cycles. It is also worth mentioning that there are multiple studies which have covered more than one subject, so the sum of all the discussed subjects may be different than the total number of articles included in the sample. As shown in the previous section that the number of articles related to ICT project success has increased rapidly in the last five years (year 2015-2020). In this study, we are interested to identify the overall trend in general and particularly the current trend of the past five years. The findings drawn from selected articles presented in the following sub-sections.

##### 4.1 Project success from stakeholders' perspective (number of articles = 20)

Project Management Institute (PMI) refers to project stakeholders as "an individual, group, or organization, who may affect, be affected by, or perceive itself to be affected by a decision, activity, or outcome of a project" (PMI, 2004). Project stakeholders have significant influence on project performances. Therefore, researchers have explored the impact of external stakeholders such as suppliers, end users, and business managers, and internal stakeholders such as project team, top management, and project managers, on the project success. For example, project success from supplier perspectives (Ahimbisibwe et al., 2017, Savolainen et al., 2012), the perception of IT professionals regarding project success, (Joia and Melon, 2019), impact of knowledge of end users and developers on project results (Inal and Guner, 2015, Tesch et al., 2009), influence of business managers' IT competencies (Engelbrecht et al., 2017), and impact of collaborative team works (Ulhas et al., 2016) on project success and other divers perspectives have been

discussed in the selected literature. Furthermore, a huge number of researchers have discussed the contribution of project manager's characteristics and skills to project success in ICT sector. For instances, influence of project manager's optimism and stress management (Smith et al., 2011), management skills (Murali and Venkatesh, 2019), leadership competencies (Podgórska and Pichlak, 2019), role in virtual working setting (Espinosa et al., 2006), and project manager's perspective of project success (Procaccino and Verner, 2006), have been discussed in the literature.

#### **4.2 Project success at different project life cycle phases (number of articles = 07)**

The life cycle of a project mainly consists of five phases of a project: initiating the project, planning project activities, project execution, controlling if there is any deviation, and closing the project. Each phase in a project life cycle is substantially different from others in terms of activities, stakeholder's involvement, resources requirements, objectives and deliverables. Therefore, researchers have explored the relationship and impact of these phases on project success separately. For instance, modeling critical success factors in project planning phase (Adzmi and Hassan, 2018), impact of planning changes, (Dvir and Lechler, 2004, Aladwani, 2002), schedule and cost estimations (Verner et al., 2007), and impact of project scope (Ahmad et al.) on project success, and exploring the adequate type of leadership competencies in the requirement phase for improving chances of project success (da Silva et al., 2019), are the key themes about project life cycles in the selected publications.

#### **4.3 Agile practices and Project success**

There are number of software development methods such as Crystal, and Lean Software Development (LD), Feature-Driven Development (FDD, Scrum, Extreme Programming (XP), which are known as agile (Chow and Cao, 2008). Agile is an event driven project management style, which is a relatively new method. A prominent shift has been seen in the literature from traditional based project management methods to agile. In this around 17.34 % of the sample (13 articles) have used agile methods.

#### **4.4 Risk management contribution (number of articles = 04)**

This sub-section discusses the influence of risk management on project success of ICT sector. Risk management is an important tool for taking timely measures to avoid risk and to improve the operational excellence of the projects. The contributions of risk management practices to the project success (de Bakker et al., 2010, Pimchangthong and Boonjing, 2017), various ways and styles (de Bakker et al., 2012), and different levels of impact of these practices on project success (de Bakker et al., 2011) have been discussed. Except these main themes, several sub-themes such as organizational culture (Bhoola, 2015), relational norms (Muller and Martinsuo, 2015), social capital (Daniel et al., 2018), and global boundaries (Espinosa et al., 2006), have been discussed in project success perspectives in the sample.



#### **4.5 Project success criteria (number of publications = 10)**

Conventionally, project success criteria were based on the components of iron triangle (time, cost and quality) (Lech, 2013). However, with changing user's requirements and business environment, success criteria have evolved based on multiple factors. In the selected studies, researchers have investigated and measured success criteria using different approaches and have enlisted a set of success factors, which have impact on success criteria. For instance, investigation of key success criteria (Wateridge, 1995), measuring success criteria (Wateridge, 1998), compilation and definition of new frameworks of success criteria (Siddique and Hussein, 2016, Thomas and Fernández, 2008), and the contribution of success factors to success criteria (Pankratz and Hasten, 2018), have been discussed.

#### **4.6 Critical success factors (number of publications = 49)**

The subject of examination of critical success factors received the highest attention from researchers in the selected literature. Researchers have explored various critical success factors and grouped them according to their characteristics in various studies. Various authors have determined a set of critical success factors (Stankovic et al., 2013), categorized them (Ahimbisibwe et al., 2015), prioritized key success factors (Yaghoobi, 2018), and modeled critical success factors (Sudhakar, 2012) of ICT projects. Nasir and Sahabuddin (2011) have investigated a set of CSFs and compared with the findings of Fortune and White (2006) to validate their results (Nasir and Sahabuddin, 2011, Fortune and White, 2006). Further, researchers have explored CSFs for different projects such as agile software projects (Chow and Cao, 2008), outsourced projects (Ahimbisibwe et al., 2017), and offshore projects (Remus and Wiener, 2009). The detailed list of CSFs for ICT projects are given in the next section.

#### **4.7 Modeling of ICT project success factors (number of publications = 08)**

ICT projects are considered difficult to manage because of its complicated nature and high uncertainties. Therefore, different researchers have identified different set of critical success factors (CSF) and used different methodologies to model these factors. Fuzzy cognitive maps (Rodriguez-Repiso et al., 2007a), Analytic Hierarchy Process, and Critical Success Chains (Rodriguez-Repiso et al., 2007b), Fuzzy AHP method (Yaghoobi, 2018) are commonly used methodology for modeling the ICT projects to reduce the associated uncertainties.

### **5 Project Success Factors**

A set of success factors influencing project results were identified through an extensive literature review. Frequency analysis and content analysis were used for identification, recording, and categorization

of success factors discussed in the selected articles. Through frequency and method analyses, we identified a set of critical success factors as has discussed in detail in the following sub-sections.

## **5.1 Critical success factor (CSF)**

Critical success factor was first used in a project context in 1980 by Rockart and defined as “the factors which predict project success” (Rockart, 1980). Later on, numerous researchers investigated multiple critical success factors in various sector projects including construction, manufacturing, ICT, and research and development. In this study, we have identified a set of 25 critical success factors through a careful review of 75 articles and ranked them in order of their relative importance based on the frequency of occurrence in the literature as shown in [Table 1]. The rate of occurrence or frequency of critical success factors here refers to the number of articles in which the respective factor has been discussed. We have arranged all the critical success factors in tabulated form, from the highly discussed CSF towards the less discussed CSF in the selected literature. The occurrences of a factor in the literature indicate their importance in the researcher’s perspectives. However, some of the factors have low occurrence rates but we still have considered them as critical success factors, because criticality depends on the literature where those factors were investigated by the researchers. This shows that the low frequency factors can also be important for the project success. However, higher frequency of the factors in the literature indicates their higher acceptability amongst the researchers concerning their criticality for project success.

The list of CSFs as given in [Table 1] shows that user participation is a largely discussed factor in the selected literature. Around 35% of the selected articles discussed user participation as an important success factor for ICT sector projects. Stakeholder’s relationship, project manager’ emotional intelligence, communications skills, and leadership skills, and top management involvement in projects are other frequently discussed success factors in the considered literature respectively.

[Table 1. Critical success factors identified in considered publications]

## **5.2 Critical success factors and regional cultures**

As mentioned in the earlier, we are following the Lewis’s categorization of culture in this study to see the trend and importance of ICT success factors in each regional group. The sample has studies from 33 countries across the world, in which 18 countries are linear-active cultures, 08 countries are reactive, and 07 were multi-active cultures. Similarly, 39 articles were published in linear active countries, 16 were in reactive and 20 articles were published in multi-culture countries. We divided the identified list of CSFs in three groups as linear-active, multi-active and reactive as given in

[Table 2, based on the country of the study.

[Table 2. Critical success factors and regional cultures]

We have found that each cultural group has different criticality for the identified set of success factors. For instance, in linear-active countries, a project manager's emotional intelligence and communications skills, user participation, and a project manager's leadership skills are the three most important critical factors respectively. In multi-active countries, user participation, management support, project planning, an incentive system and training of the employees are the largely discussed important factors. In reactive countries, definition of user requirements, project goals, user participation, and team member competence and their expertise are the most important factors for project success. [Table 2 suggests importance of different success factors for ICT projects performed in different regional cultures. This is another important contribution of this study, which the practitioners must consider during project execution in different regions.

### **5.3 Critical success factors categories**

We did a qualitative analysis of the identified factors and put each factor in a related category as given in Table 3 that is arranged according to the importance of the category of the success factors based on the occurrence in the selected studies. Similarly, we ranked (putting high referred critical success factor first and arrange other factors accordingly) all critical success factors inside each category. The number in column III of Table 3, against each factor refers to the number of articles in which the same factor had been discussed. These categories highlight the project management factors, project manager factors, environmental factors, organizational factors, project team factors, and project factors.

Project management factors combine all the factors related to project management practices such as user requirements, project goals, project planning, project communication, risk management, estimations, and project monitoring. In the given literature, 23 articles discussed at least one of the success factors related to project management category. The second most frequently mentioned category of the success factors is project manager competencies such as emotional intelligence, leadership, communication, technical, management skills, project manager qualification, and experience. This category highlights the prominent characteristics of a project manager, which influence project success in ICT sector. Environmental factor is another category, which discusses the importance of user participation and other stakeholder relationships. This category indicates the importance of user participation in projects and the relationship of stakeholders and their impacts on project success. The fourth category grouped the factors related to

organization. These factors include management support, organizational culture, organization size, incentive system, training of employees, and human resource policies.

[Table 3. Critical success factors of ICT projects based on categories]

Project team factors category gathered the factors related to the characteristics and skills of project team members such as team member expertise, their commitment and motivation toward the objectives of the project, their communication and coordination amongst other stakeholders, their project related experience and proper team building. The last and the least discussed category in the selected papers relates to project factors: the project nature, project size, access to technology, and uncertainty of innovation and their contribution toward project success. All the related factors are grouped in a similar category, which will help practitioners in understanding and controlling these factors.

## **6 Discussion**

In this section, we discuss the results, contributions, future recommendations, and limitations of the study.

### **6.1 Analysis of results**

An information and communications technology (ICT) project is the development and installation of a new product. It does not have always similar activities but mostly consist of hybrid activities that have multiple sub-projects, which needs to be managed independently (Dekkers and Forselius, 2007). The hybrid requirements of ICT projects, differentiate it from other type of projects and make difficult to manage its scope. High risk and uncertainty associated with ICT projects compared to other type of projects as it introduces completely new hardware, software or new product, which has no particular estimations and standard metrics (Dekkers and Forselius, 2007).

This study covers the articles related to project success of ICT sector published in peer reviewed international journals. The publication distribution shows that Europe with 40% of selected articles has the highest number of publications, followed by Asia (28%), USA (17%), Australia (7%), where Africa with 3% has the lowest number of publications. The highest number of articles in Europe and USA and the lowest number of articles in African countries may reflect the level of digitalization and ICT related activities in the respective regions. In spite of the apparent inequality of publications in different regions, the study is representative research about the subject spread geographically over 33 countries. Similarly, these papers cover a long range of journals dominated by International journal of project management. This shows research on project success in ICT projects is getting interest from researchers across the globe.

The trend analysis showed that the number of publications are increasing consistently. The average number of articles increased from 0.6 articles per year in 1991-2005 to 3.3 articles per year in 2006-2014 and to 7.2 articles per year in 2015-2020. More specifically, around 50% of the articles in our dataset were published in the last five years. The increasing trend may explain the developing interest in digitalization process in all over World. The analysis of published articles shows that from 2015-2020 the number of publications has increased significantly in India, Indonesia, Malaysia, and Pakistan. It may reflect national government interest and investment in the respective fields. National e-Governance Plan 2.0 (India), Digital Pakistan, and 10th Malaysia Plan (10MP) related projects could be the possible reasons for the abrupt increased in the number of publications and research activities in the respective countries.

Our study further revealed that different research methods were used in the selected literature. Surveys are the most popular method (n=31) in the selected literature because of their inexpensiveness and easy access to hard-to-reach correspondents through the use multiple modes such as online survey, email surveys, and paper survey. Further, a group of researchers have used the qualitative approach (n =15) to look deeper into the subject and discourage generalization of findings.

Similarly, this study has also classified articles based on their subjects. There were articles on diverse subjects including the role of stakeholders in project success, project life cycles, success criteria, project success factors, and modeling project success factors. As Table 1 reveals that researchers had great focus on projects success factors. There were total 49 articles in the selected literature in which researchers have investigated the relationships and influence of various factors on project success, where there were ten articles on project success criteria. This supports the notion of focusing the project success studies more on project success factors rather than project success criteria.

In this study 25 critical success factors related to project success have been identified and ranked them based on their occurrence in the considered literature. According to the analysis, as shown in the previous section, user participation, stakeholder's relationship, project manager's skills (emotional intelligence, communication skills, and leadership skills) and top management support were the highly discussed critical success factors in the literature. As various studies have investigated critical success factors for ICT projects and have ranked them in accordance to their importance. Ahimbisibwe et al. (2015) identified top management support, user participation, project team commitment, and organizational culture as the most important critical success factors (Ahimbisibwe et al., 2017, Ahimbisibwe et al., 2015). A similar set of CSFs such as user participation, clear objectives, top management support, and the skill and suitability of project team were enlisted as the top most important factors by (Warren, 2016). Similarly, in a comparative study of critical success factors performed by Nasir and Sahibuddin (2011), clear requirements, clear objectives, realistic schedule, project management skill, and top management support were emerged as the most significant factors (Nasir and Sahibuddin, 2011).

The in-depth analyses of the identified factors in the literature indicate that different levels of criticality were given to the identified CSFs in different studies. Ahimbisibwe et al (2015) have identified user participation as the second most important CSF in their studies (Ahimbisibwe et al., 2017), where it has been emerged as the top most important factor in (Warren, 2016) studies. Similarly, in this study user participation is also the most referred critical success factor. Its conflicting relationship with the project success has been discussed in the literature extensively. There are a stream of literature, which support the notion that user participation has positive relation with the project success in ICT projects (He and King, 2008), other support the importance of post-implementation of the user participation (Wagner and Newell, 2007), and some are cautious about their positive relation (Bailur, 2008). Bano and Zowghi (2015) performed a systematic review to explore the relationship of user participation and project success. They reviewed 87 studies, 52 among them supported the positive contribution, 12 suggested negative, and 23 were found uncertain about any contribution of user participation to project success. They concluded that there is a positive relation exist but it has been clouded because of the ambiguous definitions of the terminology and conflicting results of the empirical literature (Bano and Zowghi, 2015).

In short, user participation was found the most discussed success factor in the sample. Stakeholder relationship is another important critical success factor emerged in this study. As discussed above, ICT project have hybrid requirements and associated with high level of risk. It is required to have fast communication and closed relationships among stakeholders to change and adapt the project accordingly in time. Project managers' skills also emerged as important critical success factors in this study. The role of project manager has developed in accordance with the understanding of concept of project success (Blaskovics, 2016). Project manager role is not limited to manage project execution but also include stakeholder management and delivering the beneficial changes (PMI, 2004). A project managers need to be equipped with all the tools and methods required for dealing with the complex issues of changing requirements and unique technologies. Similarly, top management has ranked fifth in this study. Top management support is vital for project success to provide the required resources and guideline timely. However, appropriate ICT background and knowledge is also required for the top management to take timely and accurate decisions regarding target technology and other required resources.

Further analysis of the studies focused on the project success factors shows that importance of these success factors varies in different regions. For example, in any country where the availability of jobs is greater, the employee attrition can be higher. Hence, personnel management will be considered one of the most important skills for project managers (Bhoola and Giangreco, 2018). Therefore, we have arranged all the identified CSF based on regional cultures.

The systematic literature review revealed that the studies have identified the lists of critical success factors and have ranked them in accordance of their importance. However, a systematic division of these factors based on different cultural regions was missing. Hence, we divided the identified critical success factors in three groups as linear-active, multi-active, and reactive. Lewis was the first to categorize the culture of the World in the three categories. Each category represents and combine the common traits of a group of countries, which make it simple to understand the importance of critical success factors in each regional group. As the categorization based on traits such as the individual attitude toward work, punctuality, preferred mode of communication, personality styles, level of planning, level of job-orientation, which can influence the project performance. Therefore, this categorization is closely representing the project performance of regional groups and individual countries. This will help the practitioners to easily judge the importance of each success factor in different regional groups and countries.

We found that the identified critical factors have different levels of importance in all three regions. From the region wise analysis of the critical factors, we have the following observations. User participation is highly important in all three regions, which shows the acceptability of its importance across the globe. The possible reason for its importance may be the hybrid and customized requirements of the ICT projects, which users can better convey to the team before project execution. Project manager emotional intelligence /communication skills, user participations, and project manager leadership skills are the most important factors in linear-active group.

According to Lewis's categorization, individual of linear-active culture have common traits namely as introvert, patient, quiet, like privacy, unemotional, does one thing at a time and so on. Based on the list of common traits of the group, it is easy to see that the project manager who will deal with different stakeholders, execute the project, and will have to do many tasks at a time needs to have strong communication and leadership skills. A well-equipped project manager with strong communication and leadership skills will be in high demand at the region. Therefore, the success factors related to project skills emerged as important factors in the region. On the other hand, Lewis state that linear-active people are stick to plan, dominated by schedule, job-oriented, sticks to fact, follows correct procedures, and confront with logic. This may suggest that they are good planner, motivated, supportive, and competent. Therefore, these factors have not get high rank in linear-active region.

It is also found that user participation, top management support, effective project planning, incentive system and employees training are considered highly critical for project success in multi-active group. According to the Lewis's categorization, the common traits of multi-active group are as, extrovert, timetable unpredictable, lets one project influence another, change plan, people-oriented, seeks favors, emotional, interrupt frequently, confront emotionally and so on. Based on the common traits of the multi-active individuals, it is obvious and expected that planning, training and motivation of the personnel are

highly required in this region. Additionally, close involvement of the top management will be needed to provide the required resources in time and make sure their efficient use.

Similarly, the definition of user requirements/ project goals, user participation, and team member competence and expertise, project planning, project communication are emerged as highly important factors in the reactive group. According to Lewise's categorization, the common traits of reactive group are as: not stick to plan completely, reacts to partner's timetable, react according to the task, people oriented, ultra-honest, introvert, silent, work for flexible hours, respectful, plans slowly and so on. Individual of this groups are reactive to environment and other people. They are introvert, silent, and good listeners. This suggests that they must need effective planning, clear objectives and good communication for successful project completion. Therefore, it is rational to see the success factors related to planning, communication, and project goal of high importance in this region. Based on these findings, we concluded that regional culture should be considered as an important factor in evaluating success factors.

We grouped the related factors in different categories as project management factors, project manager factors, environmental factors, organizational factors, project team factors, and project factors. This categorization will help practitioners further understand the nature of these critical success factors, their relationships to one another, and control of these factors.

## **6.2 Contributions of the study**

- This is a comprehensive study which have ranked critical success factors in three different methods using frequency and content analysis. It gives detail information about the identified critical success factors. Which factor is important and trending in general? What is its importance in three regional groups? Which category it belongs to? Previously, the researchers have categorized CSFs based on their frequency of occurrence in general. This study has explained CSFs from cultural perspectives as well, which will make it easy for the practitioners to see the importance of each factor in different cultural regions as well as general trend.
- The study shows that the set of important critical success factors were different for each regional group. The critical success factors were varied according to the common traits of each region.
- Through the lenses of this categorization, it is reasonably easy to find the set important critical success factors for each region as well as individual countries. This will help the practitioners to give much focus on the most important critical success factor to increase the probability of the success of ICT projects in the respective region.
- On the basis of the followings findings, we can see a correlation between the process of digitalization and research activities on ICT project success factors.



- The study shows an increasing trend in the research activities in ICT success factors in general and particularly 4 Asian countries. We found that in India, Pakistan, Indonesia and Malaysia interest in the topic of ICT success has radically increased in the past five years. It may be reflecting the rapid digitalization process in the respective countries
- The study also show that the topic is not getting much interest in the African countries. It may reflect low rate of ICT projects and slow digitalization in African countries
- It is also found that the number of articles were high in Europe and USA, which may reflect their high digitalized societies and ICT related project

### **6.3 Future recommendation**

On the basis of our analysis, we suggest the following set of future recommendations

- One might carry out a study, which reflects the opinions of practitioners on the relative importance of each of the identified success factor. Further, the opinions of clients, and implementation partners needed to be further investigated to record their preferences about the identified list of CSFs.
- The identified CSFs can be investigated in different countries based on Lewis's categorization to validate the findings. This is the most needed recommended study to explore the relative importance of the CSFS in all three regions
- Further separate study is recommended to see the impact of digitalization on CSFs. To see the importance of CSFs in low, medium and high digitalized societies. This will be helpful for the practitioners to considers the set of factors in the respective societies for increasing the chances of success of ICT projects.
- On the basis of the findings of this study, it is a suggested to use a similar approach in other sectors such as power plant projects, engineering projects, and construction projects, for identification, categorization and division of critical success factors in the respective fields in different regions

### **6.4 Limitations of the study**

Although, through a highly disciplined manner, a reasonable amount of diverse articles was gathered for this study using SLR. However, the study still has some potential limitations, which must be acknowledged.

- The study has restricted to a manual search process using specific combination of search terms as listed in sub-section 2.1.2 were carried out in Scopus, Web of Science, and Ebscohost. Despite the fact that this procedure is consistent with other studies (Gupta et al., 2019, Salemink et al., 2017). However, it is possible that we may have missed some related studies not having any of the search

terms used in this study. However, the chances are very small as we have used reasonably large and diversified combinations.

- Search process was limited to peer-reviewed articles written in English. Therefore, organizations' reports, dissertations, conference papers, and studies in languages other than English were not included. Perhaps, there are multiple studies published in other languages which may complement or contradict our findings.
- In this study, the leading destinations were found as Europe, Asia, and USA. Very few articles were found from Africa, Australia, and Latin America. This may limit the generalizations of the findings of this study.

## 7 Conclusion

This systematic literature review study on project success in ICT sector was based on 75 articles published in 49 reputed international journals. The publication span of these articles was from the years 1990 to 2020. The analysis showed an increasing trend in the publications. Frequency analysis and content analysis methods were adopted in reviewing the selected articles for identification and recording the CSFs. Based on the analysis of our literature review, we identified 25 critical success factors related to project success and ranked them based on their occurrence in the considered literature. This study contributes to the academic and practical worlds in many ways. One of the contributions is to make a comprehensive list of success factors of ICT projects and calculate their relative importance. The analysis showed that user participation, stakeholder's relationship, and project manager emotional intelligence are the most important factors for the project success. This will give an opportunity to the practitioners to control the highest critical success factors to increase the chances of success in ICT projects. Another unique contribution of this study is the re-arrangement of these success factors based on regional cultures. For instance, separate lists of success factors were made for linear-active, multi-active, and reactive regions. The analysis showed that the set of critical factors are different for regions with differing levels of criticality. This gives valuable and specific inputs to the project practitioners and professional around the globe. The qualitative analysis of the identified success factors show that these factors are interrelated with one another. Therefore, we grouped all the related factors in same category. Similarly, all the factors were grouped in six categories as project management factors, project manager factors, environmental factors, organizational factors, project team factors, and project factors. This will help practitioners further in understanding the nature of these critical success factors, their relationships amongst one another, and controlling these factors for improving project success in ICT sector.

Additionally, it will also help researchers to investigate empirically the importance and criticality of the identified factors. One might carry out a study, which reflects the opinions of practitioners on the

relative importance of each of the identified success factor. Further, these factors can be investigated in different countries to validate the findings. On the basis of the findings of this study, it is suggested to use a similar approach in other sectors such as power plant projects, engineering projects, and construction projects, for identification, categorization and division of critical success factors in the respective fields in different regions.

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