Research Article

Critical Success Factors of ICT Projects in Malaysia

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ARTICLE INFO	ABSTRACT
	Attaining project success is a primary objective for project managers. To accomplish this, project managers must be vigilant in addressing the key project success factors known as the Critical Success Factors (CSF). CSFs are unique for every project and vary based on the requirements and settings. This research aims to explore the CSFs of Information & Communication Technology (ICT) projects in Malaysia. A survey was administered to a population of project managers from the professional group through an e-platform utilising the purposive and snowball sampling methodology. 194 ICT project managers responded to the survey, the survey results were listed, and 31 CSFs were ranked based on their importance using the Relative Importance Index (RII). The CSFs are based on the experience of the project managers in handling ICT projects and to the best of their knowledge on the CSF of the projects dealt with. The critical success factors (CSFs) were further analysed by computing their mean scores for each project process and subsequently discussed. The success rate of ICT projects is in a challenged state, and thus, the outcome of this research is expected to shed some light on the success of the ICT project management sphere in Malaysia.

INTRODUCTION

ICT technology is becoming an integral part of society, and the development of the ICT industry is crucial to fostering a high-performing society (Kashiwagi, 2018). The ICT industry is rapidly evolving, and to meet the customer demand for ICT services, capability, and capacity, which is ever-increasing, new technologies are being developed and deployed to the market at large. An effective and efficient knowledge transfer from developed countries is required to ensure Malaysia becomes a successful ICT user and producer (Ibrahim & Kasimin, 2010). ICT is one of the most crucial industries for developing a country, and it is essential to foster economic growth (Gössling, 2021); (Soltani, 2020). In the early days, when the world's first International Telecommunication Union event was held, ICT was merely about telecoms, which involved voice communications. This technology was realised via a fixed infrastructure managed by national operators and government departments (Huarng, 2011; Niebel, 2018).

At present, ICT has largely evolved; ICT integrates information data handling, computing, electronic communication, and telecommunication, which includes telephone lines and wireless signals (Saba & David, 2020). To measure a country's ICT performance and involvement in the ICT arena, the United Nations International Telecommunication Union developed an indicator known as the ICT Development Index (Hu et al., 2022) (James, 2012). The ICT Development Index (IDI) is a composite index designed to analyse a country's ICT readiness, ICT use, and ICT capability.

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LITERATURE REVIEW

Project budget, schedule, and quality are the main pillars of project success criteria and are also known as the iron triangle of a project (Yadav et al., 2021; Jha and Iyer, 2007; Pollack et al., 2018). Every project manager aims to complete the project within the planned budget, schedule, and quality. To realise this, the project managers must ensure robust project planning and emphasise the project's CSFs (Ojiako et al., 2008; Adzmi and Hassan, 2018). Identifying the CSF is crucial in every project to ensure success (Ayat et al., 2020). Overlooking the CSFs could have devastating implications and impacts on the project, the organisations, and the country (Afolabi et al., 2019). Hence. Project managers must vigilantly manage all the CSF linked to a project. The project managers must ensure these CSFs are identified, monitored, controlled, and worked efficiently and effectively throughout the project lifecycle. Studies show that ICT project failure is still significant (Hughes et al., 2017). While a considerable amount of research has been published on ICT project success, understanding the root cause of the problem and a clear understanding of improvement factoring in current up-to-date CSF have remained unexplored. Furthermore, it is essential to note that CSFs vary by geographical location, as the CSFs of a project in Malaysia may differ from those of the same project implemented in other countries. As mentioned in the Project Management Body of Knowledge PMBOK, every project is unique, and so are the CSFs (Adywiratama et al., 2022).

The performance rate of ICT projects is much lower than projects in other fields (Yadav et al., 20210. The life cycles of products or projects have become shorter over time due to rapid technological change and globalisation. Adding to the concern, ICT project failures have been on the rise, as reported in the Standish Group Report 2015 (Hastie and Wojewoda, 2015). They have analysed their database of over 25,000 projects to find that 56% failed to complete on budget, schedule, and quality. Proper project management skills are essential to ensure the project remains within the budget, schedule, and quality. Apart from the project management skills and the best practices learned from the theoretical perspective, the project manager must know the real-life CSFs crucial to project success. This project CSFs at every process of the project from the Request for Proposal (RFP), Initialization and Planning, Execution, Monitoring, and Control till the Project Closure process must be readily known as a guide and knowledge base to the project manager to manage the project efficiently by focussing on the main CSFs at every process. Knowing the main CSFs can give the project manager insight into the possible obstacles and help them plan solutions to apply the CSFs (Eliezer and Dror, 2019).

METHODS

There is limited research done on the CSFs for ICT projects in Malaysia. An extensive literature review of Malaysia's ICT project success factors was done in this exploratory research. The information from the literature review was used as the design foundation for the survey questionnaire. The research design of this study is based on a quantitative methodology, where a deductive approach utilising the survey strategy is used. Based on (House, 2018), a quantitative approach is a better choice for research, which requires the research object to be observed analytically. The questionnaire is divided according to the project processes, from the Project RFP, Initialization & Planning, Execution, Monitoring & Controlling, and Project Closing process. A list of CSFs at every project process and the weightage is provided in the questionnaire for the correspondent's input. The questionnaire was distributed to practising ICT project managers in Malaysia via LinkedIn and Project Management Professional (PMP) online groups.

RESULTS AND DISCUSSION

4.1 Relative Importance Index (RII)

The results of the survey were analysed by using the SPSS tool. A Relative Importance Index (RII) analysis was carried out on the critical success factors to rank the order of the essential success factors. Table 1 below shows the results of the test.

Table 1. The ranking order of the Critical Success Factors utilising the Relative Importance Index (RII)

Critical Success Factors	RII	Rank	Item Mean
Change control	0.802	1	4.010

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Top management support	0.798	2	3.990
Customer expectation management	0.773	3	3.866
Material and Parts management	0.771	4	3.856
Quality Control	0.767	5	3.835
Definition of project scope	0.761	6	3.804
Project Communication	0.761	7	3.804
RFP response lead time & accuracy	0.757	8	3.784
User participation	0.753	9	3.763
Team member allocation and coordination	0.753	10	3.763
Risk management	0.753	11	3.763
Untreated risk handling	0.751	12	3.753
Scope creep control	0.746	13	3.732
Technology and Innovation	0.744	14	3.722
Project management experience of the project manager	0.742	15	3.711
Cost control	0.742	16	3.711
Project team competence & expertise	0.740	17	3.701
Project monitoring	0.740	18	3.701
Project deliverable specification	0.738	19	3.691
Documentation and Control	0.736	20	3.680
Knowledge of project contracts	0.736	21	3.680
Project Incentives	0.734	22	3.670
Project special requirements	0.732	23	3.660
Team motivation and engagement	0.732	24	3.660
Quality Culture	0.732	25	3.660
Currency monitoring	0.732	26	3.660
Stakeholder relationship	0.728	27	3.639
Compliance with laws and regulations	0.724	28	3.619
Work package definition	0.705	29	3.526
Budget estimating method	0.699	30	3.495
Political Stability	0.693	31	3.464

The results from the RII ranking of the top 10 CSFs were discussed further. The first critical CSF in an ICT project is change control. Change control is the utmost important task of the project manager to ensure the project deliverable is within the scope, thus eliminating scope creep. However, changes in a project are inevitable, and they do occur. Changes in a project can be driven by several factors, such as uncertainties of the project scope at the beginning, venturing into new technology projects, project complexities, changes in statutory requirements, etc. Managing this change is the skill of the project manager. Based on PMBOK, the change request should be channelled to the Change Control Board (CCB) to ensure the changes are analysed and decided based on the consensus of the project steering group. Changes should be recorded and communicated to all the stakeholders to ensure smooth change execution. It is also substantial evidence if there are any queries regarding scope changes at the later stage of the project. An agile project approach addresses the issue of scope changes. In agile practice, the project can evolve and adapt to a high degree of change and uncertainties. Project activities are more iterative and incremental, objective, or the deliverable of the project, which is achieved through progressive elaboration, thus increasing the ability to respond to changes

more quickly and with better quality. The agile approach promotes a higher level of customer collaboration and customer satisfaction.

The second-ranking of CSF is the top management support. Top management support is essential as it shows the level of engagement of the top management towards the project, and it gives confidence to the project team to run the project. The top management has to ensure that the welfare of the project team is taken care of and that the team's voice is heard and addressed accordingly. This is important to ensure the smooth execution of the project and avoid unhealthy situations such as labour strikes and other negative behaviour of the project team, which would lead to unnecessary delays and complications in the project. Thus, the project manager and the top management must exhibit the quality highlighted in the Project Management Insitute (PMI)'s Talent Triangle of People Management through the appropriate leadership style.

The third-ranking of the CSF is the management of customer expectations. Managing customers' expectations can be a challenging task. In a project, the customer might have expectations that may differ from the actual deliverable of a project. Thus, it is essential to have the customer be involved in the project by keeping them well informed of the project's progress, status, and expected deliverables to avoid surprises at the end of the project. The customer's nature can vary; thus, the project manager needs to identify the customer and plan the proper engagement to ensure that customers are happy with the project's progress and that their expectations are met.

The fourth ranking of the CSF is the management of materials and parts. Management of materials and parts is critical to ensure that the supply of materials and parts aligns with the project schedule. This ensures that the project schedule baseline can execute the project execution activities. Without proper material and parts management, the project can come to an immediate halt due to a lack of material or parts. This will delay the project and lead to cost escalation, thus leading to project failure. The procurement management skills of the project manager are an essential aspect of ensuring that the material and parts are ordered on time and available when required by the project. The project manager must ensure that all lead times for the material, parts, and other factors and constraints are considered when planning the procurement.

The fifth ranking of the CSF is the control of quality. Quality is of the utmost importance in a project. It is one of the main components of the project management triangle, also known as the project management triple constraint, which has been used since the 50s. It consists of time, cost, scope, and quality at the centre of all three constraints. To ensure the quality of project deliverables, the project manager must establish a comprehensive project quality management plan. This includes leveraging data from the project 'cookbook,' a knowledge base containing lessons learned and retrospectives from past projects. From this, past project experiences can be used as a reference to improve and increase the quality of projects. The project manager should recommend and allocate an appropriate and reasonable appraisal cost, such as inspection and testing, quality audits, calibration of testing equipment, and supplier evaluation, which would benefit the project's quality. In general, the costs of the preventive actions are lower than the costs of the corrective action. Preventive actions save time and protect the company's reputation by proactively implementing measures to address potential failures before they occur.

The sixth ranking of the CSF is on defining the project scope. A well-defined project scope ensures minimum changes in a project, thus saving time and cost. This would also prevent unnecessary gold plating and scope creep. The project scope should be well understood and defined at the beginning of the project to ensure that the project objectives are met and project deliverables are handed over to the customer satisfactorily at the end of the project. In project management, customer satisfaction is paramount, and it is the project manager's responsibility to ensure that all the project activities and deliverables are aligned with the project scope and plan.

The seventh ranking of the CSF is on project communication. Project communication is a critical knowledge area that the project manager must master. According to PMBOK, on average, the project manager utilises 80 to 90% of the time in a project in communication. The project manager's good communication skills are essential to lead a project team internally and externally. It is also critical in managing conflict, fostering collaboration among the project stakeholders and enhancing teamwork. A good communication plan should be established at the beginning of the project to ensure that the project information is delivered to the stakeholders promptly. The project manager should

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also plan for the proper communication methods, whether interactive, push, or pull, based on the requirements and needs. The correct method and tools would ensure efficient and effective project communication.

The eighth ranking of the CSF is on the project RFP response lead time & accuracy. In the modern competitive world, the RFP response must be made as soon as possible; a slow response to an RFP response creates a question mark on the competency of the project team. The project team must prepare the RFP response quickly and quickly and ensure the RFP is accurate. Inaccurate RFP information and commitment may lead to unnecessary changes, contributing to cost escalation and disputes. Hence, a competent team and subject matter experts must be lined up to ensure that the information provided in the RFQ is accurate and robust.

The ninth ranking of the CSF is on the project end-user participation. Collecting requirements from the end-user gives an insight into the end-user's needs and expectations. Thus, the scope and objective of the projects can be defined to meet the user's needs and expectations. Involving the end-users in the project process also reduces the rejection rate of the end deliverable of the project to the users; this is because the end-user is already aware of the final deliverable that they are going to receive, and there would not be any elements of surprises.

The tenth ranking of the CSF is the project team allocation and coordination. To ensure effective and efficient resource utilisation, team members must be assigned to project activities based on their expertise and competencies. Assigning the right resource to the right task ensures optimal project outcomes. This necessitates strong resource management skills from the project manager and effective collaboration with functional managers to recruit and allocate the appropriate resources for the project.

4.2 Measure of Central Tendency (Mean)

The data from the respondents were further analysed, and the CSFs based on the project processes were identified. The top 3 CSFs during the project RFP process are top management support (3.9897), the definition of project scope (3.8041), and RFP lead time & accuracy (3.7835). The mean score of all the CSFs for the project RFP process is shown in Table 2.

Table 2. Critical Success Factors During Project RFP Process

Critical Success Factors	Mean
Top management support	3.9897
Definition of project scope	3.8041
RFP response lead time & accuracy	3.7835
User participation	3.7629
Project management experience of the project manager	3.7113
Project team competence & expertise	3.7010
Documentation and Control	3.6804

The top 3 CSFs during the Project Initialization & Planning Process are team member allocation and coordination (3.7829), risk management (3.7629), and cost control (3.7113). The mean score of all the CSFs for the project Initialization & Planning Process is shown in Table 3.

Table 3. Critical Success Factors During Project RFP Process

Critical Success Factors	Mean
Team member allocation and coordination	3.7629
Risk management	3.7629
Cost control	3.7113
Project special requirements	3.6598

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Stakeholder relationship	3.6392
Work package definition	3.5258
Budget estimating method	3.4948

The top 3 CSFs during the Project Execution Process are material & parts management (3.8557), project communication (3.8041), and untreated risk handling (3.7526). The mean score of all the CSFs for the Project Execution Process is shown in Table 4.

Table 4. Critical Success Factors During Project Execution Process

Critical Success Factors	Mean
Material & parts management	3.8557
Project communication	3.8041
Untreated risk handling	3.7526
Scope creep control	3.7320
Technology and Innovation	3.7216
Team motivation and engagement	3.6598
Quality Culture	3.6598

The top 3 CSFs during the Project Monitoring & Control Process are change-control (4.0103) and quality control. The mean score of all the CSFs for the Project Execution Process is shown in Table 5.

Table 5. Critical Success Factors During Project Monitoring & Control Process

Critical success factor	Mean
Change control	4.0103
Quality control	3.8351
Project monitoring	3.7010
Currency monitoring	3.6598
Political Stability	3.4639

The top 3 CSFs during the Project Closing Process are customer expectation management (3.8247), project deliverable specification (3.6907), and knowledge of project contracts (3.6804). The mean score of all the CSFs for the Project Execution Process is shown in Table 6.

Table 6. Critical Success Factors During Project Closing Process

Critical Success Factor	Mean
Customer expectation management	3.8247
Project deliverable specification	3.6907
Knowledge of project contracts	3.6804

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Project Incentives	3.6701
Compliance with laws and regulations	3.6186

CONTRIBUTION OF RESEARCH

Based on the studies done by Standish Group, the project failure rate of ICT projects is still worrying. The advancement of science and technology has no meaning if it is not delivered to humankind through projects. Hence, there is a critical need for the project management fraternity to improve the current project management processes and ways of working to ensure that the project implantation success rate increases. This study gives an insight into the CSFs that contribute to the project's success; 31 CSFs have been ranked based on their criticality and importance to project success. The analysis was further done to identify the CSFs of a project at various project processes. These findings will guide the project manager in ensuring they focus on all the critical CSFs correctly. At multiple processes, the CSF of focus will change, and the project manager needs to focus on the correct critical success factor for a particular process to increase the efficiency and effectiveness of the project management processes based on PMBOK. The CSF model will be a guide for junior project managers who don't have the experience to gain insights into the project CSFs. There are many CSFs in theory, but understanding which CSF to focus on and emphasising the proper project process is paramount.

CONCLUSION

To deliver a successful project is the aim of every project manager. However, achieving project success is not an easy endeavour. The world is advancing in science and technology and entering an era of innovation. The projects associated with this advancement are increasing in complexity and requirements, thus increasing the challenges and constraints to achieving project success. Project managers, on the other hand, must ensure that the project is successful and have to walk the extra mile to make the project successful. The CSFs must be the project manager's prime focus to do this. CSFs are an essential aspect of the project that must be explored to ensure the project failure rate can be reduced. It is crucial to examine the CSFs at every project process as the CSFs vary at different project processes. Identifying CSFs at each project stage and implementing appropriate action plans to address them is essential for project success. A project manager who proactively prioritises and integrates CSFs into the project strategy enhances the likelihood of achieving desired outcomes.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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