Introduction for factors of success and failure by using IoT in project management

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A B S T R A C T

The Internet is a relatively recent endeavor that has continued without conclusion for a considerable length of time, growing in importance to individuals, organizations, and governments everywhere until we finally settled on the term Internet of Things (IoT) to describe its ubiquitous application of multiple technologies across all spheres of human endeavor. In addition, the variety of IoT applications and use cases expands annually. There will be a need for this trend to grow substantially in order to satisfy the enormous amount of demand. Whether or not an IoT application is successful, simple to deploy, and user-friendly depends on a number of things. Based on research on the causes of success and failure in the implementation of IoT, it has become clear that most studies focus on either success factors alone or failure factors alone. This paper aims to bridge that gap by discussing the factors that contribute to the Internet of Things' success and the factors that lead to its failure, both of which aid in the technology's growth and dissemination and provide guidance to experts in the field.

1. Introduction

The expression "Internet of Things" (IoT), coined back by Ashton (2009), the British technology pioneer who confounded the Auto-ID Centre at the Massachusetts Institute of Technology, is becoming more and more mainstream (Hassan, 2018). The Internet of Things (IoT) is an important topic in the technology industry, policy, and engineering circles and has become headline news in both the specialty press and the popular media (Dang et al., 2019). This technology is embodied in a wide spectrum of networked products, systems, and sensors, which take advantage of advancements in computing power, electronics miniaturization, and network interconnections to offer new capabilities not previously possible. An abundance of conferences, reports, and news articles discuss and debate the prospective impact of the "IoT revolution"—from new market opportunities and business models to concerns about security, privacy, and technical interoperability (Rose et al., 2015).

There is no standard identification of the "Internet of Things." Considering the functionality and identity as central it is reasonable to define the loT as "Things have identities and virtual personalities operating in smart spaces using intelligent interfaces to connect and communicate within social, environmental, and user contexts." A different definition that puts focus on seamless integration could be formulated as "Interconnected objects having an active role in what might be called Future Internet" (Tan and Wang, 2010).

The Internet of things (IoT) refers to physical objects such as mobile devices, home appliances, vehicles, or even buildings that are embedded with sensors and connectivity capability to collect and exchange data and eventually take appropriate actions after analyzing the data autonomously (Hsu and Lin, 2018).

This study aims to determine factors that affect the success or failure of using IoT in IT companies in Bahrain. This study examines the factors that make using IoT successful or make it fail. Additionally, this study facilitates the understanding of the features, functions, and critical factors that companies must consider when developing IoT in their departments.

2. Literature review

This literature review explores what factors causes success or failure of IoT projects, in order to

consider IoT as a part of business, it is essential to study the factors identified previously that are impacting the adoption of IoT by businesses and consumers across the world. As IoT is not a very old technology, it faces innovations and evolutions very frequently, being influenced by various business, environmental and organizational factors as shown in Table 1. These factors impact the probability to adopt this field by many businesses. Multiple researchers presented various studies, explaining the reasons behind the postponements of IoT's adoption, top of them are lack of knowledge in the field of IoT, and its features and minimal

understanding of its usefulness in various sectors (Al-Ghaith et al., 2010).

The determinants affecting IoT are the intention to adopt and ten independent factors, which are technology readiness, compatibility, complexity, executive management support, firm size, regulatory support, security concerns, cost savings, compatibility, and relative advantage (Olushola, 2019). For the successful deployment of IoT-based products and services, the top five technologies that are essential are radio frequency identification (RFID), wireless sensor networks (WSN), middleware, cloud computing, and IoT application software (Prasher and Stephen, 2020).

Table 1: Summary of literature reviews

Reference	Title	Description
(Prasher and Stephen, 2020)	The Internet of Things (IoT) Upheaval: Overcoming Management Challenges	Provide detailed knowledge about the existing IoT management philosophies, tools and their challenges, pros and cons, and how to scale these to improve the success rate of such projects.
(Olushola, 2019)	Factors affecting IoT adoption	Explores some of the factors affecting IoT adoption, analyzing the determinants, other challenges, gaps, and future IoT developments
(Prasher, 2018)	Internet of Things (IoT) and Changing Face of Project Management	Provides an overview of IoT concepts and through a systematic review of scholarly research papers, blogs, review articles, and other literature available online, it addresses the current managerial challenges for such projects.
(Nnaji and Awolusi, 2021)	Critical success factors influencing wearable sensing device implementation in AEC industry	Investigates the success factors (SFs) for implementing wearable sensing devices (WSDs) for safety and health monitoring within the construction industry
(Mohanty et al., 2022)	Analysis of critical success factors to mitigate privacy risks in IoT Devices	Ascertain how to effectively mitigate privacy risks in IoT devices. A user-centric approach is employed to increase user control and flexibility. After a detailed analysis of the extant literature, critical success factors that are lauded to alleviate risks in IoT devices were synthesized and collated.
(Hakim et al., 2021)	Critical Success Factors for Implementation of Internet of Things (IoT) in Automotive Companies: Literature Review	Discussed literature review related to Critical Success Factor (CSF) implementation of Industry 4.0 in the manufacturing industry.
(Hughes-Lartey et al., 2021)	Human factor, a critical weak point in the information security of an organization's Internet of things	Propose an Organizational Information Security Framework for Human Factors applicable to the Internet of Things, which includes countermeasures that can help prevent or reduce data breach incidents as a result of human factors.

This study contributed to helping MIS managers to know what the factors of successes and failure are of using IoT in their companies to take precautions when using it on their jobs. This study was established to find the factors which cause the success or failure of any project. The comprehensive analysis of this study added to the existing research by determining the benefit of finding the most popular factors of success and failure of using the Internet of Things on project management from all aspects. To holistically analyze the priorities of these characteristics, has not been done before. Private and governmental bodies, especially departments concerned with the use of the Internet of things, will be informed of the results of the study to draw their attention to the most popular factors of success and failure of using IoT.

There are three main questions in this research as follows:

Q1: What are the factors available causing the success of using IoT in project management?
Q2: What are the factors available causing the failure of using IoT in project management?

Q3: What are the suggestions to solve the problem of factors that affect the failure of the use of the Internet of Things in Bahrain?

The hypotheses of the research are as follows:

H1: The factors of success in using IoT have a positive significant impact on project management.
H2: The factors Failure to use IoT has a significant negative impact on project management.
H3: Prior knowledge of the factors affecting the success or failure of the use of the Internet of things helps to MIS (Management Information Systems) department to avoid the factors causing failure to use IoT.

The main objectives of this research can be summarized as follows:

- To investigate factors that cause success or failure using IoT in Bahrain.
- To determine the priority of the selected factors that causes the success or failure of IoT implementation in Bahrain.

- To suggest the improvements to factors that are currently used in determining which affect the success or failure of IoT implementation in Bahrain.

This study will be implemented in Bahrain IT companies. Using a survey, meetings, and the questionnaire, which has important questions about the factors of success and failure to use IOT in project management, to know the MIS manager's opinion about the factors of success and failure to use IOT in project management in their companies. Afterward, the results of the questionnaire will be analyzed by using the SPSS (Statistical Package for the Social Sciences) software to show the results of this study.

This study contributed to helping MIS managers to know what are the factors of successes and failures of using IoT in their companies to take precautions when using it on their jobs. This study was established to find out the factors that affect the success and failure of any project from the point of view of project management. The comprehensive analysis of this study added to the existing research by determining the benefit of finding the most popular factors of success and failure of using the Internet of Things on project management from all aspects. To holistically analyze the priorities of these

characteristics, has not been done before. Private and governmental bodies, especially departments concerned with the use of the Internet of things, will be informed of the results of the study to draw their attention to the most popular factors of success and failure of using IoT.

3. Factors of success or failure of IoT

At the occasion of that IoT World Forum 2017, the company also released data from a survey that looked at the success and failure rate of Internet of Things projects and initiatives, as well as the conditions for IoT success in times that IoT is increasingly present in the digital transformation strategy journeys of ample organizations. According to data released by Cisco, 74% of surveyed organizations have failed with their IoT initiatives. This is mainly because there are several human factors involved in IoT implementation, beyond the functional elements of sensors and networks. Effective collaboration and integration among all the components of IoT, along with creating a culture of technology within the organization are required to succeed. Table 2 shows factors that cause the success and failure of IoT.

Table 2: Factors that cause the success or failure of IoT

No.	Factors that cause success	Factors that cause failure
1	Allocating hardware specs	Regulatory support
2	Estimate and figure out all costs	Managing the data flow
3	Implementation of security and governance	Billing
4	Improve IoT projects continuously	Power consumption
5	Intuitive users experience	Scalability
6	Focus on the Business Challenge	Security concerns
7	Enable scalable data management and analytics	Missing the right people and mindset
8	Design-in security	Compatibility
9	Plan for flexible device management	Organizational culture
10	Strategic Planning before Deploying	Lack of readiness
11	Collaboration:	Lack of clear planning and strategy
12	Clearly defined goals	Cybersecurity
13	Competent project manager	Ignorance of the latest technologies
14	Sufficient resource allocation	Lack of skilled professionals
15	Adequate communication channels	Limited guidance for maintaining IoT devices
16	Control mechanisms	Non-authentication and authorization of IoT devices
17	Feedback capabilities	Lack of knowledge and staff resources
18	Responsiveness to clients	The "high" investment cost
19	Leadership	No clear definition of IoT
20	Firm size	Lack of a strong project roadmap

4. Methodology

To satisfy the objectives of the dissertation, qualitative research will be held. The main characteristic of qualitative research is that it is most appropriate for small samples, while its outcomes are not measurable and quantifiable. Its basic advantage, which also constitutes its basic difference from quantitative research, is that it offers a complete description and analysis of a research subject, without limiting the scope of the research and the nature of participant's responses. However, the effectiveness of qualitative research is heavily based on the skills and abilities of researchers, while the outcomes may not be perceived as reliable

because they mostly come from the researcher's personal judgments and interpretations. Because it is more appropriate for small samples, it is also risky for the results of qualitative research to be perceived as reflecting the opinions of a wider population.

This study will be implemented in Bahrain IT companies. I will use the questionnaire, which has important questions about IOT and the changes it does to their jobs, to know the manager's opinion about the impact of using IOT in their companies and study the effect and how IoT enhances the job and the results of income for the company and for their employers. Afterward, I will analyze this data by using the SPSS program to show the result of this study.

4.1. Data analysis

The statistical analysis system will be used to analyze the data collected from personal interviews and answers to the questionnaire. In order to know the results digitally through the use of the SPSS and transfer all written data into numbers, graphs, and charts. And these results verified the study objectives and also helped to give a conclusion.

5. Summary

This paper discusses the factors that cause the success or failure of the Internet of Things. As many factors are neglected by managers and users, which leads to the failure of the project of using the Internet of Things. The objectives are also described in the paper so that the study and the result can be carried out properly. The method for determining the type and number of respondents who fit the purpose of the data collection process is also discussed. The importance of the study was also determined in terms of determining the influencing factors, especially the cause of the failure of the use of the Internet of Things, to give an idea to the beneficiaries before using it, of course, if this study was conducted correctly. Finally, the full study summary is summarized.

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Compliance with ethical standards

Conflict of interest

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

References

Al-Ghaith W, Sanzogni L, and Sandhu K (2010). Factors influencing the adoption and usage of online services in Saudi Arabia. The Electronic Journal of Information Systems in Developing Countries, 40(1): 1-32. https://doi.org/10.1002/j.1681-4835.2010.tb00283.x

Ashton K (2009). That 'internet of things' thing. RFID Journal, 22(7): 97-114.

Dang LM, Piran MJ, Han D, Min K, and Moon H (2019). A survey on internet of things and cloud computing for healthcare. Electronics, 8(7): 768. https://doi.org/10.3390/electronics8070768

Hakim IM, Singgih ML, and Gunarta IK (2021). Critical success factors for implementation of internet of things (IoT) in automotive companies: A literature review. In the 11th Annual International Conference on Industrial Engineering and Operations Management, IEOM Society International, Singapore, Singapore: 5199-5207.

Hassan Q (2018). Introduction to the internet of things. In: Hassan Q (Ed.), Internet of things A to Z: Technologies and applications: 1-50. John Wiley and Sons, Hoboken, USA. https://doi.org/10.1002/9781119456735

Hsu CL and Lin JCC (2018). Exploring factors affecting the adoption of internet of things services. Journal of Computer Information Systems, 58(1): 49-57. https://doi.org/10.1080/08874417.2016.1186524

Hughes-Lartey K, Li M, Botchey FE, and Qin Z (2021). Human factor, a critical weak point in the information security of an organization's internet of things. Heliyon, 7(3): e06522. https://doi.org/10.1016/j.heliyon.2021.e06522 **PMid:33768182 PMCid:PMC7980069**

Mohanty S, Cormican K, and Dhanapathi C (2022). Analysis of critical success factors to mitigate privacy risks in IoT devices. Procedia Computer Science, 196: 191-198. https://doi.org/10.1016/j.procs.2021.12.005

Nnaji C and Awolusi I (2021). Critical success factors influencing wearable sensing device implementation in AEC industry. Technology in Society, 66: 101636. https://doi.org/10.1016/j.techsoc.2021.101636

Olushola OB (2019). Factors affecting IoT adoption. IOSR Journal of Computer Engineering (IOSR-JCE), 21(6): 19-24.

Prasher VS (2018). Internet of things (IoT) and changing face of project management. M.Sc. Thesis, Harrisburg University of Science and Technology, Harrisburg, USA.

Prasher VS and Stephen O (2020). The internet of things (IoT) upheaval: Overcoming management challenges. The Journal of Modern Project Management, 8: 24-37.

Rose K, Eldridge S, and Chapin L (2015). The internet of things: An overview. The Internet Society (ISOC), Reston, USA.

Tan L and Wang N (2010). Future internet: The internet of things. In the 3rd International Conference on Advanced Computer Theory and Engineering, Chengdu, China, 5: 376-380.