What Impact does Internet of Things have on Project Management in Project based Firms?

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ABSTRACT

The highest benefit of IT spans through the enabling of personnel to attain their organizational goals. However, acquiring the IT skills that were not aware of in the past will boost and enhance the personnel for greater performance. IoT technology gives understanding from novel data generated and gives solutions. Therefore, allowing organizations to access new strategies via technological innovation will bring about efficiency and productivity with the project lifecycle. However, this project aimed at assessing the impact of IoT on PM in project-based organizations. A qualitative method of investigation was adopted through interviews and discussions with 9 selected respondents. The result shows the benefit and the usefulness of IoT in project-based organizations. This was assessed using the five project management model namely initiating, planning, executing, control and monitoring, and closing. It is established that the impact of IoT can be seen using any of the five stages. Hence, this study identifies the most critical elements of any project-based organization to include people, possessing on personnel and how their impact the invention of project-based organizations.

Keywords: IoT, Project management, project-based organizations, Project lifecycle

INTRODUCTION

Business and organizational environments have experienced many changes and pressures, especially on project management (PM) over the past years, varying from normal businesses to the worldwide development of projects. However, digitalization has always been there to offer possible help on how to operate fasters, more collaborative, learn more, as well as yielding unmatched outcomes. Primarily with the development of global markets, above all, organizations undertaking many projects at a particular period, the internet of things (IoT) will necessitate the actualization of PM through project comprehension during the lifecycle of the project. Starting from projection launch to finishing, IoT ensures a stress-free transition in all the stages of the project lifespan as well as tactically aligning with the organizational goals and objectives. Despite the differences, each organization stand for or their unique setting and culture, the project management guidelines and disciplines help in customizing their practices. In other words, project management symbolizes a principal tool in conveying modernizations to the organization or business (Morris et al., 2010). Thus with the purposefully allocating the personalized approaches of project management in an organization, the barriers, and challenges existing all over the whole project lifespan will be involved by the project group and controlled based on the project plan. Frankly speaking, efficient use of project management fetches qualitative developments in the organizational results (Somasundaram and Badiru, 1992).

Innovation shows a vital part in calculating the difficulty of projects. Hence, IoT and ICT innovation is offering the possible tools, solutions, and support needed to project managers during the implementation of project management guidelines within the evolving environments. Customarily, PM has been applied and in the administration procedure of controlling a project at a moment centered in a particular location (Evaristo and Fenema, 1999). This is generally concerned with outputs/inputs procedure (Gorton et al., 1997). IoT and ICT are offering a crucial and phenomenal partnership aimed at project managers as well as other teams, stakeholders, and labor forces in the project site and process. In an attempt to note the success rate of project management in project, which is one of the critical characteristics of PM is its capacity to collect data, analyze

data, control data, and monitor as well as communicating it through acquaintances engaged in numerous projects and diverse place (Jonsson et al., 2001).

According to a past United Nations (UN) article that mentions another verge of a new era of the global model where humans will form a portion of the minorities once it identifies the assembling of data. The revolution is conveyed around by the ICT which are working to be promoted by IoT, which is considered to be generated by those networking everyday objects. Currently, big data and information denote a significant module to retain in an organization and make available a viable benefit over its contenders and contained by the ever-evolving markets. This analytically offers new models for the treatment of data collected from IoT tools, giving real-time Data (RTD) analysis and assembly (Ghimire et al., 2015).

Despite the substantial investigation into organizational information technology applications, it is still a big issue among organizations. Information technology (IT) application is difficult, costly, and time-consuming, and every business is distinct in respect of their relevant operation, stakeholders, and purposes (Motiwalla and Thompson, 2009). Hence, the degree to which acknowledged application principles can be valuable to an organization accepting IT is limited. Application of internet of things technologies could be engaged to an additional level and organizations that adopt it are finding it challenging and very scary. It is a well-known fact now to organizations, the necessity of internet of things (IoT) technologies not only to simplify gradually difficult supply chains but in addition to being capable to communicate with clients. Conversely, the internet of things application is principally perplexing from the time when it is not a statistics system carry out, on the other hand, a flourishing and evolving group of smart IT technologies that are generating a vast volume of big data. This big data need to be analyzed so that it can add value or be valuable to the organization, which is a model talk about to as the IT efficiency contradiction (Liu et al., 2016). It is particularly vigorous for firms to have an understanding and concentrated on IoT considerations, policies, and implementation approaches when embracing the internet of things technologies.

This article focuses on investigating the usefulness of IoT incorporation in project management. However, it also focuses on highlighting the perquisites that develop commencing such incorporation. Interrelated models and doctrines of IoT and PM incorporation will be used as a standby and backing the evaluation.

LITERATURE REVIEW

Project Environment

According to Gaddis (1959), a project is defined as an organizational unit set aside to the realization of an objective and a goal, usually the effective finishing of a developing invention on time in a budget, and conformation with set goal and performance provisions. Also, PMI (2008) defined a project as a transitional work embarks on to produce a matchless product and service in growing expansion.

The terminology takes into contemplation of diverse features primarily for the business ideology and the model of an organization. However, the project represents the unification point of different features and characteristics like team roles, limited budget, use of resources of a different kind, lifecycle, limited period availability, performance measure, and defined goal and scope. Couple with the usefulness and impact on the organization's business plan; it is accredited, merging all the past elements, a definite level of ambiguity which reduces during the implementation of the task (Burke, 2014).

Despite the task or work can last for months or years, the project at all times operate the same serious 5 stages that contain the project lifespan or lifecycle. The project has a duration in which tools, skills, and individuals are needed to use materials effectively to finish the task (Jugdev et al., 2013). According to PMI (2008), a project lifecycle is a sequential collection of project stages whose number and name resolute by the control requirement of the firm or firms taking part in the project. However, a project lifecycle can be predictable with a method presented in Figure 1. To be precise, there are five stages or phases that are accustomed to every project, these include initiation, planning, executing controlling and monitoring, and closing.

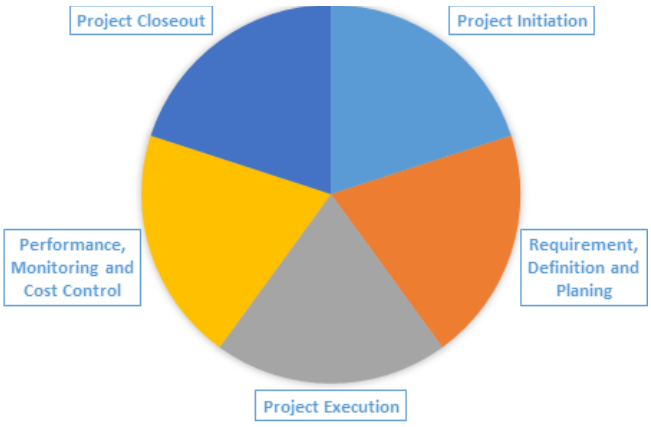

Figure 1: Pictorial illustration of Project Lifecycle

Project-based Organization

Projects is vast becoming an important approach to organize work in many firms (Bakker. 2010) and compose one of the major acute organizational improvement (Winter et al., 2006). The word project is very popular in discussing modern organizations, even small-scale and cosmopolitan organizations used it to explain their business model or project-oriented as an additional worth to their productions (Soderlund, 2004).

Project-based firms are centered principally on the primary worth delivered by the project management course, which in the end is created by the firm itself. Turner and Keegan (2001) clearly stated the significance of the project management course as a method to express project-oriented business when they describe the branding of desires and applications from clients and customers as a major driving factor for organizational structure. In other words, considering the application or appeal from customers as an initiate for the project-oriented system, it is the firm itself that chooses to accept such a premediated optimal for its corporate model depending on the organizational plan of administration by the project (Huemann, 2014). However, a project-oriented business' model centered on the revolution boast and the search for composite invention structure designed by Hobday (2000). He also stated project-oriented business is capable to manage with developing assets in the invention and reply adaptably to exchanging customer wants. Also, efficiency at incorporating several types of skill and knowledge with project vision and risks. Such contexts center the organization on the uniqueness of purposes, goals, or outcomes (Whitley, 2006), to be frank, the unique clarifications are provided to main customers because of complex, concrete, and well-structured networks of coordinated contracts and suppliers.

Jackson (2006) advocates and recommends an amalgamation of several systems, elements, methods as a major factor. With singular repute to the human factor, the ability to generate a solid culture cycle and loop is known as the core PM abilities vital for the additional expansion of the business (Figure 2) (Staadt, 2012).

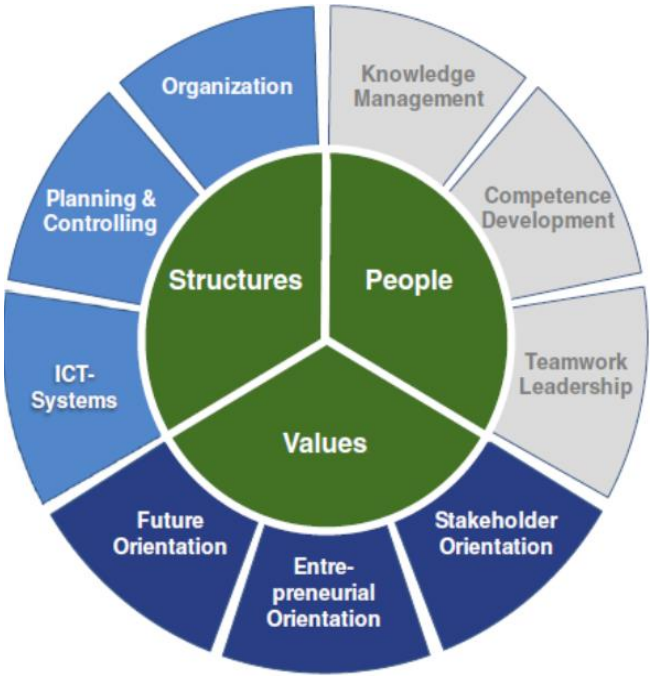

Figure 2: Classical of the project-oriented business

Internet of Things (IoT)

It is clearing that lives in the 21st century is more sophisticated and beneficial to us, thereby making us see impossibility possible. Technological advancements have changed the way society functions. Moreover, advancement and globalization in the IT system have given us another *human,* coincidental to portion data when on earth and anyplace needed. The internet and networking have simplified our lives in many ways to a point that one cannot distinguish the difference between it and the business environment. Since the inception of internet acceptance in the workplace, tremendous growth has been observed over the years. Recently, a leap concerning the perception of a unified smooth object is flagging its way. However, this had shades of brightness on the evolving perception of the IoT.

IoT Network Planning and Principles

Owing to the complexity associated with IoT's setting and networks need to be investigated from different standpoints. These comprise service-level, system-level, and user viewpoints. Resuming with a system-level outlook, in which we can clearly state that the internet of things is a unified system building up of smart entities that create and consume data. There are so many devices that support physical processes and exacerbate schedules that may affect the somatic area, the possible interface with the physical realm getting possible. Also, the service-level perception, the challenge was really in the incorporation o the information renders by the clever objects into facilities. Hence, for an organization to achieve such framework approaches required for the acceptance with the objective of smart object illustration and virtualization in the ordinal field.

Additionally, approaches that disclose IoT facilities to achieve further worth to end-users should be stressed. Owing to the high attractiveness of areas and among organizations themselves, the internet of things can give units modest benefits over their competitors. Likewise, IoT tools request is not limited to a positive sector. Studies have shown that IoT will greatly advantage regions such as x workplace, healthcare, and home support, account and invention organization, eco-friendly, surveillance, and security monitoring. To end with, and from a user perspective, IoT will upsurge end-user self-actualization by providing new methods facilities, which are aimed at client want, that mark clients need. IoT will involve a modification from "always on service" (which now spread on to our Web era) to "always approachable initiate facilities." This change sites a run-time and ad hoc appeal that responses to the user's exact daily events and tailor-made needs.

Project-based organizations and IoT

Big project-oriented representatives include oil and gas, energy, or mining will be improved gradually by the

application of IoT systems. In the precise corporate environment, challenges must be faced, and issues need to be addressed to ensure implementation of the technology. Both technological and social aspects should be understood before the IoT application will be widely accepted. Considering big projects such as offshore platform construction, mining, or excavation project, the number of workers and companies involved during the life-cycle is immense. Hardly, they will be attached to the same podium working on the same documents.

Each of them will use proper software and individual documents which are shared in case of necessity among the teams, but the cooperation will stop at this stage. It is usual to handle multiple files at a time and irregularly the action interconnection of sharing is somehow difficult and unsuccessful. It is very important to accept the internet of things in a project environment and it will form central implementation. It is significant at the design stage and setting up the action, to guarantee high smooth of variation between the approaches of the structure, thereby improving an undependable manner of the phases. Internet of things systems is constantly checking the background through dynamic and sensors causing related variation in real-time and decision gave these clients, conservational situation, or other shareholder fondness. The application will then expand the scope and provision more rapid decision-making by the elaborate participants (Atzon et al., 2010). Normally, the entrance too many concise data sources and information may support high impact variations and the development to each stage of the task lifecycle.

Growing cognizance is a significant benefit of IoT for the contemporary business ideal secret a project-oriented firm, it impulses managers to brand more educated choices. IoT hitches are not connected fully to the communication within setting and shareholders; networking features are acute in an equivalent amount.

Despite, all the fundamentals constituting the construction of the internet of things in a Project, such as wireless and RFID entities are categorized by low capitals and probable, in terms of calculating energy and power. All the conceivable resolutions must take into deliberation the source productivity of the intact scheme and the conceivable scalability of the hitches (Ferreira Da Silva et al., 2016).

METHODS

To achieve the research objectives stated for this study, primary data was used by conducting interviews and discussion sessions. We believe that this process will provide us with the needed insights of both highlighting possibilities, discipline, and matching points. The method provided theoretical data about PM change of paradigms from a classic process to customized and modern methods collected with the internet of things account of potential benefits and obstructions to putting into practice.

However, 9 semi-structured interviews conducted with a practitioner, experts, and professors who have existed as acting project managers, chief executive officer (CEOs), and product managers within different sectors (see the details of the interview session in Table 1). We were interested in learning more about the different values that identify the internet of things. Thus, the investigation's group of candidates be in the right place that is diverse geographical pedigrees such as Italians, Arabs, and Swedish.

Whereas the secondary data was designed to assist the thorough appreciation of the focus that we are dealing with. However, secondary data include investigations published by several academic personnel and practitioners together with many related organizations and agencies through semi-structured interactions or interviews.

Table 1: Details of interviewees and the duration of interviews

S/N	Position	Experience	Business area	Country of Residence	Mode of Interview	Duration
1.	Senior lecturer(SL)	Above 29	Business Administration	United State	Physical	45 mins
2.	SL	Less 3	Informatics	Sweden	Phone	20 mins
3.	SL	Above 20	Informatics	United State	Physical	40 mins
4.	Project Manager	Above 25	Innovative and technological incorporation	Italy	Skype and phone	30 mins
5.	Professor	Above 30	Project management consultant	Lebanon	Zoom	50 mins
6	CEO	Above 35	ICT consultant	Italy	Zoom	70 mins
7.	CEO	Above 15	Construction consultant	Saudi Arabia	Skype	60 mins
8.	CEO	Above 7	Innovative and technological incorporation	Lebanon	Phone	30 mins
9.	Project manager	Above 35	Innovative and technological incorporation	Saudi Arabia	Skype	45 mins

Saunders et al. (2012) and Bryan and Bell (2003) encourage a research plan that is centered on using diverse and various sources of information. They debated that the most operative plan is that which understands the real-world practices and proves result while restraining potentials avoiding any bias and error. Hence, a suitable approach for the research of the internet of things and modern PM were selected. Cognizance of the complexity of the methods and practices that are desired to change in the direction of technological adoption and development. Centered on previously defined findings, we choose the qualitative approach for the drive of implementing a detailed and general interpretation of the internet of things and PM activities, system, and processes.

Our study aims to highlight the significance of the revolution technology, the internet of things, and its impact on project management in project-based organizations. However, a qualitative investigation method is more appropriate as it will offer a better understanding of the project management perspective in project-based organizations according to Bryman and Bell. 2003). Also, qualitative approaches offer a preference in the direction of reproduction of a constructionist and interpretivist position. The choice of qualitative method is based on the epistemological assumptions, with an interpretivist attitude, the capability to understand the viewpoints of a project manager centered on their experiences. Also, it is buttressed by ontological concords important as constructionism, as the shared process is built by several shareholders, examples include donors, project team, beneficiaries, and project manager and all these shareholders have a significant role in delivering the outcome of the internet of things project. However, the questionnaire was divided into sections. The construction is used to increase lucidity and statement among interviewers and interviewees.

RESULT AND DISCUSSION

According to (Bengtsson, 2016) irrespective of ideological viewpoints or background, the ultimate aim is to analyze data and organize and provide meaning and draw a reasonable conclusion. The impact of the internet of things in PM and project-based environment.

The research questions were divided into five groups that were captured in question 9 which depicts the project lifecycle. In practice, the five groups include initiation, execution, planning, monitoring and controlling, and then closing stage.

The respondents wholeheartedly agreed that information technology, initialization, and the process of automation are sub in project management and successful implementation. The advantages are several in numerous fields of project-based environment. The new technological fracture in the internet of things will be of help and improvement in respect of the projects teams laboring in positioning it with one another irrespective. Most of the respondents agreed to the significance of information technology and the digitalization approach offering the best assistance in the project completion and PM. The role of the internet of things is yet to be fully developed and still not applied in most businesses, but the chances of the background are endless once applied policy and productivity.

To deliver excellent service about the impact of the internet of things and the project lifecycle, it is adequate to subsection the exhibition of data in the initial stage within the various stages of the projects.

Initiation Stage

Respondent 1 stated an important change of paradigms methods to conceptual stage owing to the significance of internet of things acceptance. Despite the novel, technology will assure a greater degree of adaptability in manipulating the results of the task shifting from product to service organizations strategy. An important invitation stage is an application, much in technological and production company, permitting for geolocation altogether with the straight selection of the product or hardware. To deliver a level evolution of works from production to supply, despite all the materials for that good are produced presented immediately the devices indicate RFID tag. Having in mind the secure flow of information, respondents 1 and 2 suggest that delivers primarily understanding on the prerequisite in the scope of the project distressing the intense initiation stage. The change in paradigms explains by respondent 1 do not only affect the output of the project, but the internet of thing also desires new meaning for what affect the project characteristics and it discusses solely to objects. Work parcels, and objectives in the project-based environs.

Owing to the data collected from previous research, the data gathered will turn as a reference point to new project strategies, financial budgeting getting the acceptable amount of labor strength needed, although helping in the change from the initiation stage to the planning. It is noteworthy that both respondents 1 and 3 express the high impact of the internet of things in project management.

Planning Stage

Respondents 8 and 4 reported that the internet of things network and IT will support an efficient and effective means of collaboration and communication with numerous contractors and customers thereby permitting for distribution of data and project prerequisites.

Therefore, creating it understandable for all shareholders on the project scope to all stakeholders on the project scope. The application in the preparation stage will produce higher implementation rudiments for operating and turn as direction while incorporating the project.

These landscapes are essential to make an additional supple and unified network, impacting deeply on the preparation movements of the project crew thanks to the keen matters used in the setting.

On a whole, has been emphasized in what way in overall forecast and Costing, Source restraint running, and quality assurance assessments are artificial by the internet of things through the complete project lifecycle, and largely customary in the planning stage.

Executing Stage

Respondent 6 states the usefulness of executing stage as a strategy for assessing the impact of the internet of things. He describes the stage by equating the internet of things to 3 key factors such as productivity, effectiveness, and efficiency according to respondents (4:6:5).

Examining the whole internet of things network, in the earlier stages that is initiation and planning, shows that not all the constituents are important to guarantee smooth running, on the other hands, in this stage, it is essential to guarantee constant and efficient networking of all the smart object installed. Without this stage, there will be no monitoring and managing stage.

Besides, internet of things technology normally functions as the policy feature to project managers as their sole role is to execute and deliver improved direction or positioning with the firm plan.

Monitoring and Controlling Stage

All most all the respondents (1,3,4,5,7,8 and 9) unanimously agreed that the benefits of the internet of things can be detected by the outcome at this stage. The decision-making is enhanced at the monitoring and managing stage. They believed that the real-time data from several geographical locations, systems, and devices permitting efficient and effective plan assessments to be accepted.

The risk factors can be eliminated with proper and effective monitoring and handling. Internet of things is very important to handle shifts and problems uttered by external forces in real-time. These include delays in gaining procedure.

Closing Stage

All respondents accepted that the closing stage allows for proper assessment of the impact of IoT on PM.

Performing as issues in helping the upkeep of the work, taking the devices and labels left in the project to measure the mechanisms, and appeal upkeep agendas according to respondents 7 and 8. All the data generated could offer the organization a new type of project and they assurance the active distribution of project results. A new sort of project would focus on the upkeep and helpful services of the work offered. The effective batch of deliverables is an assurance to clients through data serene from sensors entrenched in the work according to respondents 8 and 9.

Conclusion and Recommendations

The emergence of technology has brought smoothness and clarification in the handling and monitoring of organizational projects. Although, the use of IoT in PM is still growing the enlightened project managers are embracing the light and the impact that is coming from IoT technology. The result of this investigation showed that IoT impacts PM in project-based organizations especially using the five stages described in this study. All the reviewers at one point or the other agreed to the enormous contribution of IoT in project management. Thus, our qualitative findings have shown a blue light that might turn around business for a greater profit. Hence, we recommend the use of IoT for implementation and planning for better organization goals and objectives optimization.

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