

What Factors Are Challenging to Manage a Project in Industry 4.0?

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ABSTRACT

One of the main causes of the earlier industrial revolutions was the speed at which technology was developing. However, in terms of technological advancement and socioeconomic impact, it is anticipated that the fourth industrial revolution (Industry 4.0) and its integrated technology dissemination progress will expand dramatically. Industry 4.0 creates new organizational business models and human-centered manufacturing systems that have an effect on society, the environment, and the entire value chain. The Industry 4.0 is improving things so much that they are improving things even more. However, there are dangers and difficulties associated with developing a project in any Industry 4.0 area. Making a project will undoubtedly require some sort of difficulties. This essay examines the difficulties of putting Industry 4.0 into practice.

Keywords: Industry 4.0, Project Management, Internet Of Things, Cyber Physical Systems (CPS)

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INTRODUCTION

Benefits and difficulties for the socioeconomic standing of the nations involved in such transformations were associated with each industrial revolution. Industry 4.0 is defined by the sophisticated digitalization and integration of logistics and industrial manufacturing processes, as well as the use of the internet and "smart" objects (i.e., products and machines) and the fusion of the real and virtual worlds through the use of information and communications technology (ICT). The fourth industrial revolution, known as "industry 4.0," was initially presented in 2011 at the Hannover Fair in Germany. It later gained traction as a trend for the manufacturing sectors of the future. Industry 4.0, also known as the umbrella term for the new industrial paradigm, refers to a number of future industry features, including robotics, big data, cloud manufacturing, augmented reality, cyber-physical systems (CPS), internet of things (IoT), and internet of services (IoS). The process of information interchange, action, and control will be stimulated by embracing these technologies as the primary development in more intelligent manufacturing processes, including devices, machines, modules, and products. This will ultimately lead to an intelligent manufacturing environment.

The manufacturing sector may virtually digitize the integrated sensing devices in all industrial components, goods, and equipment thanks to Industry 4.0. Implement this digital system globally as a pervasive system that combines functionality with physical items. It will evolve more quickly and have a bigger social impact than any of the preceding industrial revolutions—1.0, 2.0, and 3.0. To ensure a seamless transition throughout the concept's execution, a number of obstacles must be identified in a

methodical manner. This may apply to project management as well, starting with goal-setting and continuing through data management, project management techniques, and project handoff.

LITERATURE REVIEW

Industry 4.0 refers to the growing intelligence of products and systems, as well as their cross-company integration into value creation networks and intra-company cross-linking. Again, setting up any project using this technology is difficult. The Fourth Industrial Revolution, which is presently occurring, presents a variety of organizational, managerial, and technological problems for manufacturing firms. The Internet of Things (IoT), Industrial Internet of Things (IIoT), cloud-based manufacturing, and smart manufacturing are the four primary forces behind Industry 4.0. These technologies enable the complete digitization and intelligence of the manufacturing process [1]. It is challenging to predict the precise risk associated with digitization, but it is increasingly obvious that certain workers in certain nations are less protected than others. For example, almost 25% of occupations in some areas are highly vulnerable to automation. Any project is more complex to create and develop because of all these dangers. This analysis examines the shortcomings and difficulties associated with project management in Industry 4.0.

The industry has evolved from the early adoption of mechanical systems to today's highly automated assembly lines due to the discovery of new technologies, which has made it possible for project managers in Industry 4.0 to be flexible and adaptable to the present dynamic market requirements and demands [2]. Difficulties with embedding, predictability, flexibility, and resilience to unforeseen circumstances. Numerous observations and studies can be made on difficult issues related to Industry 4.0. due to the fact that project management in Industry 4.0 still has a lot of gaps. And managing any project involves Industry 4.0, which increases the challenge. This research paper looks into challenging factors for project management in Industry 4.0.

CHALLENGES TO MANAGE THE PROJECT IN INDUSTRY 4.0

Challenges for Proper Project Management Skill and Communication in Industry 4.0

Choosing the project's primary aim or purpose is the first stage in the project development process. Because the first step in developing a project is to start with something where quality is the most important consideration. Comprehending client needs is one of the project's objectives. Effective project management abilities are the key to a great deal of success in large, mature enterprises. Project managers, who now have to deal with a new environment that includes many aspects of Industry 4.0, will be the primary leaders of those advancements. Communication is another issue that comes with project management in Industry 4.0. Naturally, the team as a whole needs this communication the most. This correspondence may be addressed to the client. Once more, this communication might be with an outside vendor. Therefore, effective project management and communication are both difficult.

Economic Challenges to Manage a Project in Industry 4.0

Building the necessary infrastructure to oversee a project in Industry 4.0 requires significant financial outlays. This is when the business model needs to be adjusted. Overspending or questionable financial returns are another difficulty when managing an Industry 4.0 project.

Social Challenges to Manage a Project in Industry 4.0

Industry 4.0 project management also presents issues with privacy, monitoring, and destruction. One of the main obstacles in project management is stakeholders' general resistance to change. Danger of the corporate IT department going out of business; loss of numerous employment due to IT-controlled and automated operations, particularly for workers in the blue color.

Political Challenges to Manage a Project in Industry 4.0

Political obstacles to project management in Industry 4.0 include a lack of standards, regulations, and certification programs. Uncertain legal matters and data security present further difficulties.

Organizational Challenges to Manage a Project in Industry 4.0

IT security concerns are among the organizational obstacles faced by projects in Industry 4.0. Stability and dependability are essential for crucial machine-to-machine (M2M) communication. Preserve the authenticity of the manufacturing procedures. Avoiding IT issues is necessary to prevent costly production outages. Need to safeguard industrial expertise. insufficient skill sets to accelerate the shift to the fourth industrial revolution. Inadequate personnel qualifications.

Technical Challenges to Manage a Project in Industry 4.0

It is something of a problem to create and manage any project in the Industry 4.0 without this new technology specialist. However, there are difficulties involved in putting this technique into practice. Let's now talk about the technologies used in the sector, their applications, and the difficulties associated with integrating them into project management.

Internet of Things

Industry 4.0's ever-expanding infrastructure is the Internet of Things. It is a network of internet-connected gadgets that can communicate between points and transfer commands and data. The fundamental idea behind this concept is that a wide range of items, including mobile phones, sensors, actuators, and Radio-Frequency Identification (RFID) tags, are constantly present around us and are connected by unique addressing schemes like IP addresses. These items can communicate with one another and work together to accomplish shared objectives [3]. The system is starting to fail. The environment is changing as a result of the processes and management style of the projects becoming more complex. The success of the project mostly depends on communication and information exchange, and issues are made more difficult and complex to handle when there is a significant level of uncertainty in the scenario. It is a given that there will be numerous variations from the initial project plan while managing projects within varied groupings, many of which are situated in remote areas [4].

System Integration

The two main mechanisms in industrial organization are self-optimization and integration [5]. Data Integration and Management are included in this linked Industry 4.0 presents new difficulties, so businesses must adapt quickly and become inventive with technology. A firm may have a variety of hardware and software components that must work together harmoniously to yield the greatest possible value. Maintaining current and functional systems is one of the primary problems of the fourth industrialization. It will take a skilled project manager with sufficient understanding to complete system integration projects integrating both new and old systems. Systems integration and Industry 4.0 are two fields that are always evolving; thus, engineers must pursue ongoing professional development to stay abreast of new developments. It's not an easy task to connect a system, piece of equipment, or component to a network. It's also a challenge.

Cyber security and Cyber Physical Systems (CPS)

With the increased connectivity and use of standard communications protocols that come with Industry 4.0, the need to protect critical industrial systems and manufacturing lines from cyber security threats increases dramatically. With the increased connectivity and use of standard communications protocols that come with Industry 4.0, the need to protect critical industrial systems and manufacturing lines from cyber security threats increases dramatically. With the increased connectivity and use of standard communications protocols that come with Industry 4.0, the need to protect critical industrial systems and manufacturing lines from cyber security threats increases dramatically. With the increased connectivity and use of standard communications protocols that come with Industry 4.0, the need to protect critical industrial systems and manufacturing lines from cyber security threats increases dramatically. With the increased connectivity and use of standard communications protocols that come with Industry 4.0, the need to protect critical industrial systems and manufacturing lines from cyber security threats increases dramatically. Industry 4.0's growing connectedness and reliance on common communications protocols make it imperative to safeguard vital industrial systems and production lines against cyber security risks. Therefore, effective identity and access management of both computers and users, along with secure and dependable communications, are crucial [6]. Strong ties across the digital, service, and physical worlds can enhance the quality of information needed for manufacturing system design, optimization, and operation. The primary features of CPS include decentralization and the autonomous behaviour of the manufacturing process. By intelligently connecting cyber-physical systems with the aid of cloud technologies in real time, data is continuously exchanged [7]. Cyber-physical system optimization and real-time manufacturing operation are made possible by giving cyber-physical systems a great deal of thought [8]. Industry 4.0 brings with it increasing connection and the usage of standard communications protocols, which raises the need to protect manufacturing lines, system data, and important industrial systems from cyber security attacks. It is really difficult to regulate.

Additive Manufacturing

Additive Manufacturing is a 3D printing technology that can reduce the weight and cost of product components. In the smart factories of the manufacturing industry, 3D printing is a key component of a wider computerized transformation process in project management. The smart factory will speed up and streamline manufacturing while providing real-time data on parts and finished goods. An increased awareness and a cogent strategy will be necessary for Industry 4.0 project managers, especially additive manufacturing project managers, to adequately address issues like the protection of intellectual property rights, trade secrets, and data, as well as increasing liability risks, because businesses involved in additive manufacturing will bring complexity and new legal challenges.

Autonomous Systems

Industry 4.0 allows machines and objects to function independently as well as communicate with one another. Artificial intelligence and robotics have largely advanced in autonomous systems, which are capable of performing a wide range of activities to high standards without continual human supervision. Its objective is to transform conventional industrial production facilities into intelligent factories. It is still unclear how best to implement these ideas in the packaging sector. Project management is a significant technical problem.

Big Data

Unbeknownst to them, businesses can generate enormous amounts of data, which may have latent potential for expansion and enhancement of their operations. However, big data will be produced in a variety of formats by several data sources representing various industry segments. Project managers in Industry 4.0 face a significant problem in big data analytics since the diversity of the data it contains

could work against them. Ensuring the integrity and high quality of data recorded by production systems presents a problem. Due to the wide variety of data entity annotations, integrating disparate data repositories with various semantics for advanced data analytics is becoming more and more difficult [9].

Cloud Computing

The "cloud" is rapidly providing IT services in order to reduce costs and space requirements while also presenting creative use cases. The project manager's responsibilities remain mostly the same when apps are delivered on the cloud. It is not necessary for the project manager to be an expert in the specific technology; instead, they are usually responsible for maintaining project momentum and providing progress updates. The project manager must, however, ensure that cloud providers take action to resolve issues with disaster recovery, security, and performance. The project manager must comprehend every risk area and determine who is in charge of tasks related to issues. The main obstacles here are cost and danger.

Challenges for Risk Management

An additional significant difficulty of project management in Industry 4.0 is learning to manage and prepare for risk. In project management, risks can arise from various sources. There is always a chance that a project won't proceed as planned. The process of locating, evaluating, and reacting to any risk that emerges during a project's life cycle in order to keep it on course and achieve its objective is known as project risk management. Anything that might have an effect on a project's budget, schedule, or performance is considered a risk. There are many different kinds of hazards, including project, technical, and business risks. In the context of project management, risk management refers to a thorough and organized process for locating, evaluating, and handling risks in order to meet project goals [10].

Table (1) Challenging factors to manage a project in Industry 4.0

1. Managerial challenge
• Project goals set
• Leadership knowledge
• Communication
2. Economic challenge
• Business model adaption
• High economic costs for investment
3. Social challenge
• Privacy concerns
• Insecurity
3. Politocal challenge
• Lack of regulation
5. Technical challenge
• Technical skill
• Experience
• Project knowledge
6. Team building
• Empathy
• Motivation
• Risk Management

DISCUSSION

The manufacturing value chain can be completely changed by the upcoming Industry 4.0 technology. Manufacturers can respond quickly to a variety of changes resulting from fluctuating demand, stock levels, or unplanned equipment failures thanks to digital-to-physical operations. It is difficult to use this industry's technology for project management. The majority of new technology-based manufacturing initiatives in project management face a general investment issue. Research indicates that higher autonomy and sociality skills are necessary for self-organized systems in smart manufacturing systems. For an industry, implementing all of the Industry 4.0 pillars will cost enormous sums of money. Thus, one of the two hurdles is investment, and the other is truly technical. Based on these industry issues, it is advised that project managers improve their technical abilities in Industry 4.0. due to the industry's lack of technically qualified workers. Developing more technological expertise will save money. Given the significance of this work, it would be feasible to establish a project with the difficulties this paper discusses in order to oversee the project in Industry 4.0. Because this paper discusses many project management issues that can be overcome to create a successful technology-based project, in addition to the technical challenges associated with project management in the context of Industry 4.0. These are problems that anyone can use to their advantage when developing a project. Further research has been conducted on the technical challenges related to the limitations of this paper. Research on the difficulties faced by project managers and risk managers in project management was scarcer. We can conduct more investigation on them if there are other scopes. Future research endeavours may involve conducting extensive studies on the aforementioned issues, or it may be necessary to conduct additional study on the technological challenges. Research on potential solutions to the problems at hand is also possible.

CONCLUSION

In Industry 4.0 projects, complexity and uncertainty—two major theoretical traditions in project management—play a significant role in defining and mouldings the features that are required to handle the workload and are correlated with the projects' growing complexity. In Industry 4.0, project management requires both technical and managerial expertise.

Methodology consists of data, model development and method used. The paper can be either quantitative or qualitative. However, if the paper is quantitative, equations may appear in line with the text, if they are simple, short, and not of major importance; e.g., $a = b/c$. Important equations appear on their own line. Principal equations are numbered, with the equation number placed within parentheses and right justified. Authors are strongly encouraged to use MS Word Equation Editor or Math Type to create both in-text and display equations. Equations are considered to be part of a sentence and should be punctuated accordingly.

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