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Key Factors Driving the Adoption Internet of Things in Manufacturing Industry and Associated Challenges

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ABSTRACT: ***The Internet of Things (IoT) is an innovative technology that is rapidly gaining popularity. It has a wide range of uses in daily life as well as in many other sectors and industries. A worldwide dynamic information network with linked items and devices that strives to connect and interact with other people, services, and devices at any time and from anywhere is what might be referred to as this phenomenon. In order to build intelligence into devices so they can process information and data and learn, the Internet of Things (IoT) makes use of a variety of cutting-edge technologies. As a result, real-time, autonomous, and intelligent decision-making systems are created that mimic human decision-making processes and eliminate the need for human involvement and intervention. In this paper, the author discusses the key drivers involved in the adoption of IoT in manufacturing industry. In addition to that, author also discussed the possible associated challenges such as security and cost that are preventing from harnessing the full potential of IoT which need attention for future exploration.***

KEYWORDS: ***Internet of Things (IoT), Cost, Manufacturing Industry, Technology, Security.***

1. INTRODUCTION

Internet of Things (IoT) connects customers, businesses, and goods. A new age with a more connected environment that all children experience results from this. Industry and the industrial sector are being transformed by a worldwide technology called the internet of things. See a few IoT applications in the industrial sector now. It has been discussed the use of digital manufacturing. The Internet of Things (IoT) was used to examine several processes and their choices, including business, mobility, security, and heterogeneity. In today's manufacturing system, IoT based on software was employed. By using an IoT system with a three-stage manufacturing process, the procurement, product recovery, manufacture, and acquisition were all optimised. It was reported on the many difficulties and essential elements of IoT design and implementation. The issues of modelling and simulation have been researched in the internet of things. Performances have been improved using smart systems and production performance. The function of IoT in the manufacturing and materials sectors, as well as its applications, were studied in the current review article [1], [2].

The Internet of Things is changing how businesses, especially those in the industrial sector, conduct their operations. Up until now, technology has mostly been employed for business administration, management of manufacturing operations, process automation, and data collection

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connected to assembly activities. IoT on the other hand, goes much further in terms of data collecting [3]. The Internet of Things (IoT) enables the gathering of data on operations, quality, consumption, usage, production, etc. from various "Things" and uses it to simplify and improve business processes. The Internet of Things (IoT) is expected to have a significant influence on manufacturing organisations by enabling them to better plan, control, integrate, analyse, and optimise operations through the creation of a network of linked machines, systems, devices, and people. Manufacturing firms will have several potential benefits as a result of this connectivity and the data that is produced from this linked network, including the chance to strengthen the distribution network, improve operations, and enhance the customer experience.

1.1. Key Drivers of IoT adoption in Manufacturing

The main adoption drivers for the Industrial IoT solutions include (Figure 1):

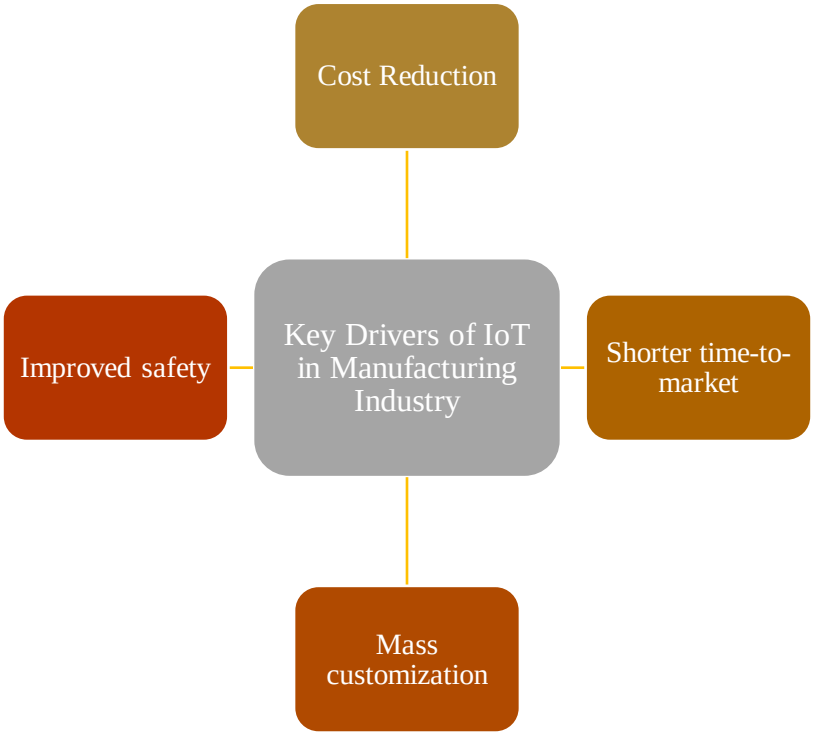

Figure 1: Illustrating the major drivers of IoT in Manufacturing Industry.

1.1.1. Cost reduction

Companies minimise operating expenses and develop new income streams as a result of improved asset and inventory management (leading to cheaper inventory carrying costs and search times), less machine downtime, more flexible operations, and more efficient energy usage. For instance, selling experiences such as product consumption and after-sale services may be done with the help of smart, linked items[4], [5].

1.1.2. Shorter time-to-market and Mass Customization

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Reducing product cycle time is possible with faster and more effective production and supply chain activities. For instance, Harley-Davidson used IoT to restructure their production facility in York, Pennsylvania, and was able to cut the time it takes to create a motorcycle from 21 days to just six hours[6], [7].

Inventory grows and becomes more varied as a result of the mass customisation process, which necessitates a huge growth in the diversity of generated SKUs. The complexity of manufacturing processes also increases since the creation of 10 pieces of SKU Y might happen just after the production of 20 units of SKU X. Monitoring the production processes and the inventory becomes difficult and, in some situations, impossible.

1.1.3. Improved safety

A safer workplace is made possible with IoT. By combining wearable technology with IIoT, it is possible to monitor the health of employees as well as potentially dangerous behaviours. IoT solves safety issues in potentially dangerous locations as well as assuring the safety of employees. For instance, in the oil and gas sector, IoT is used to track gas leaks as they move through the system of pipes.

2. DISCUSSION

Implementing IoT for industrial organisations is not without its risks and obstacles, despite the enormous advantages it may provide. The following is a discussion of some of the greatest issues that manufacturers have while utilising IoT (Figure 2).

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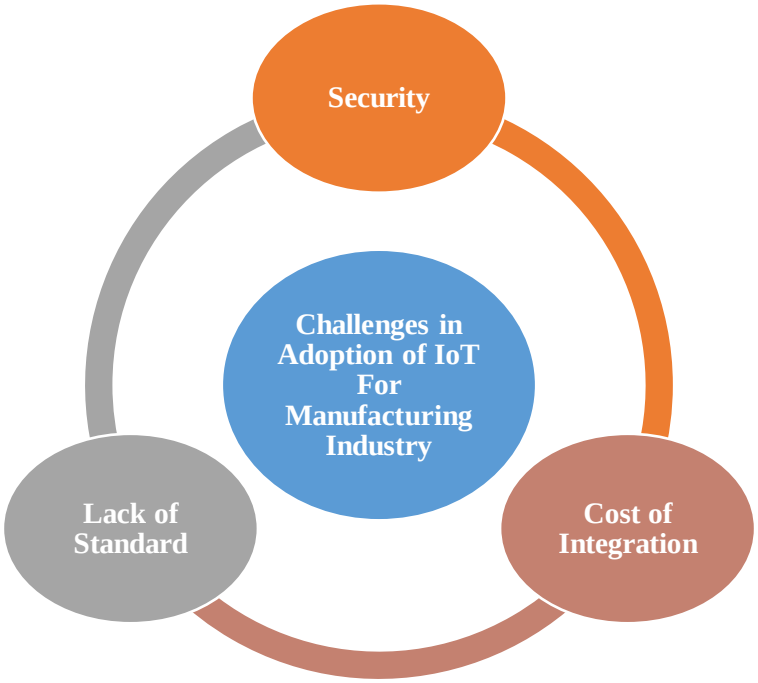

Figure 2: Illustrating the three main challenges faced during use of IoT in Manufacturing Industry.

2.1. Security

Companies will almost definitely want to expand the technology to the rest of the organisation if an IoT pilot project succeeds. Yet, adding intricacy to an IoT solution by way of additional networks and devices raises security concerns. To overcome this issue, each device that communicates and exchanges information must use SSL encryption.

2.2. Cost of Integration

Custom IoT work is sometimes more expensive than buying an off-the-shelf gadget. When using an off-the-shelf solution, a third-party IoT development partnership will charge for costs like as testing and bespoke features that aren't a worry when using a third-party IoT development partner. Nevertheless, the overall cost of a tailored IoT solution may be less than that of an off-the-shelf device, which can be difficult to operate and sometimes includes unnecessary features. A made - to - order IoT device, on the other hand, provides customers with exactly the functionality and data they want to make business operations more effective and productive [8].

The expense of constructing a bespoke website vs. utilizing WordPress or another content management system is a suitable example here. Behind the scenes, WordPress contains a lot of frills and whistles that can cause the site to become bulky and sluggish, as well as overwhelming visitors who are unfamiliar with the platform. A custom website is much more expensive to design

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initially, but individual get the precise style and functionality he desire and can establish a long-term connection with the development partner[9].

2.3. Lack of Standards

The absence of standardization in the IoT, particularly for hardware, continues to be a significant implementation hurdle. The hardware industry is mostly a black box since many integrated designers and engineers have their own peculiar ways of carrying out tasks. IoT hardware design still generally lacks tools for software development and standard practices like unit testing. IoT developers must adhere to these guidelines and carry out their ideas in an open and accessible manner for the benefit of the customer, nevertheless. Due to this, Very employs Nerves, an open-source framework for creating IoT firmware utilizing contemporary software design techniques and tools. Nerves enables programmers to test firmware before turning it into embedded device-compatible standard C++ code[10].

3. CONCLUSION

A successful IoT implementation considers both the causes and rewards as well as the impediments. Because of this, an IoT strategy is critical, just as it is for any important and significant corporate or even societal event. While developing IoT solutions for the manufacturing industry has its obstacles, they may be addressed and overcame by collaborating with the proper IoT development partner.

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