International Journal of Computational and Electronic Aspects in Engineering
Volume 4, Issue 3, September 2023, pp 78 - 85
https://doi.org/10.26706/ijceae.4.3.20230904

Information Technology for Smart Business

A. V. Karthick[1,*], S. Balasubramanian[2]

[1]Department of Computational Logistics, Alagappa University, Karaikudi, India
[2]Department of Computer Science , Alagappa University, Karaikudi, India

avkarthick@gmail.com[1], ssbala04@gmail.com[2]

*Correspondence: avkarthick@gmail.com

Abstract— A completely automated production system equipped with cutting-edge digital technologies is referred to as a smart business. Its emergence is viewed in many studies as the beginning of a new wave of production innovation. Smart businesses use a combination of physical and cyber technologies. As more and more objects acquire intelligence, scientists and engineers work to create not only cutting-edge technology but also smarter homes, factories, and even cities. The fourth industrial revolution the current design of the digital factory makes it necessary to construct the smart business in order to make the associated technologies through technology and deep integration of previously independent discrete systems. Despite the recent sharpening of conceptions, it is challenging for industrial companies to build a clear. Within the maze of varying terminology, thoughts and ideas, design a strategic roadmap. This study discusses the smart business in order to provide both researchers and practitioners with more clarity and to consolidate the prior findings. Reduced human operator involvement and an emphasis on automation systems are the main goals of Industry 4.0. However, this goal has shifted in Industry 5.0, which attempts to maintain a balance while maximizing the advantages from human-machine interaction. The goal of Industry 5.0 is to improve the relationship between people's inherent productivity and ever-more-powerful machinery.

Keywords— technology, smart, business, industry

Technical Note – Peer Reviewed
Received: 17 June 2023
Accepted: 12 August 2023
Published: 12 September 2023

Cite this article: A. V. Karthick, S. Balasubramanian, "Information Technology for Smart Business", *International Journal of Computational and Electronic Aspects in Engineering*, RAME Publishers, vol. 4, issue 3, pp. 78-85, 2023. https://doi.org/10.26706/ijceae.4.3.20230904

1. Introduction

Mark Weiser was the one who first created the IoT concept. The term "Industry 4.0" was also created by the German Economic Development Agency (GTAI) to describe the more complex and sophisticated than they now are. Smart factories provide the opportunity to create new sorts of efficiency and flexibility by effectively connecting diverse processes, information streams, and stakeholders including frontline workers, planners, etc.

Choi Kwang Hun and Gyu Hyun Kwon, 2023 reveals that necessary to take an ecosystem perspective that incorporates the science, technology, and business (S-T-B) areas that influence the innovation ecosystem when developing strategies for spotting possibilities in innovation [1].

The goal of this study was to identify potential areas for innovation in the S-T-B fields along the value chain of smart grids by analysing intelligent patterns and interactions. The evolution of the smart grid value chain and its potential as a tactical instrument for upcoming innovative problems were recognised through multi-dimensional data sources matching to the S-T-B fields. This study has significance for both practise andpolicy because it pinpoints a gap in the innovation system and offers insightful data that might help to rekindle consumer and private sector participation.

Zhang, Chang, et al., 2023 emphasize the importance of technology in E-Commerce industry to provide an efficient and precisely tailored experience for each customer, customer insights must be gathered, segmented, and analysed. For each consumer, a successful and tailored experience must be created, which requires analysis and segmentation of customer insights. With the help of machine learning algorithms, price optimization can be automated to increase profitability when pricing decisions are made correctly. Automating price optimization using machine learning algorithms is possible when pricing decisions are made correctly [2].

2. Literature Review

We have witnessed significant technology advancements during the past 20 years, including both disruptive software and hardware developments. The term "digital transformation" refers to the fusion of information, communication, and artificial intelligence as well as the cross-fertilization of many different ideas. Industry 4.0 is referred to represent a paradigm shift in industrial production that is driven by the fusion of Internet and developing technologies.

From the 18th century to the present, a series of industrial revolutions have changed the political, ecological, and cultural landscape of the planet. These broader technological advancements produced new tools, power sources, and methods of work organization that increased the productivity of already established industries. By integrating information and communication technology more deeply into manufacturing, Industry 4.0 promises to leverage cyber-physical systems, but automating.

3. Hierarchical Structure Of Smart Business

There is much discussion on the construction methods or smart factories. Standards for the implementation of smart factories have not yet been developed. In their discussion of earlier studies on the idea of the "smart business" is truly an exploration of adaptive and flexible manufacturing.

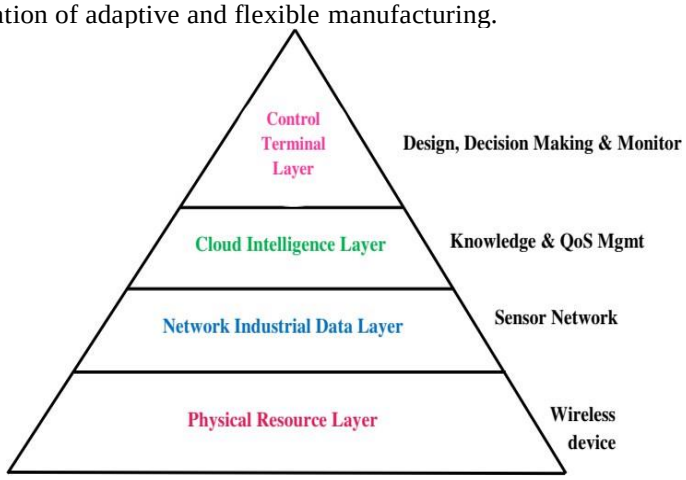

Figure 1. Hierarchical Structure of Smart Business

An architecture given by Wang Shiyong, et al. 2016 making it easier to set up manufacturing resources in the best way possible. Hierarchical Structure of Smart Business using IoT is shown in Figure 1 and consists of four distinct layers: the physical resource layer, the industrial network layer, the cloud layer, and the layer for supervision and control terminals. The physical resources have been transformed into intelligent objects that can interact with one another via an industrial network [3].

3.1 Physical Resources layer

The layer of physical resources included products for packing, conveyor equipment, and intelligent equipment. It was primarily in charge of carrying out responsibilities including processing, watching, and assembly. The information on the manufacturing process served as the higher application's main data source. It includes a variety of physical objects, including smart equipment, smart products, and smart conveyors.

3.2 Network Industrial Data Layer

Within the smart business, layers were connected using the network layer. According to distributed control, field bus, Modbus, and EtherCAT were used to connect the controller and actuator. The self-organized network was created by combining Ethernet and DDS to connect the various pieces of equipment. The integration of Ethernet and OPC UA, which allowed for data exchange, was used to connect the equipment to the cloud platform. In the smart business, the network layer, which is defined by sensing and control, is crucial. Real-time and dependable network techniques are needed for data transfer, information exchange between intelligent devices, and manufacturing cloud platforms as a result of advancements in cloud computing technologies. Advanced information technologies (such field buses and IWSNs, for example) and their related technologies offer a crucial means of satisfying the aforementioned needs. It creates a crucial infrastructure that links the physical resource layer and cloud layer in addition to facilitating communication between artefacts. Given the unstable traits of the smart business, the IWN is superior than wired networks like industrial Ethernet.

3.3 Cloud Intelligence Layer

Cloud Coverage The cloud platform, a Hadoop-based service cluster system that supplied data storage and computational resources for data applications, was part of the cloud service layer. The cloud platform was used to build the packing line's ontology model, which formed a relationship between objects in the dimensions of structure and interaction. The smart business is supported by another type of significant infrastructure. A network of servers that offers tiered services such as Infrastructure-as-a-Service (IaaS), Platform-as-a-Service (PaaS), and Software-as-a-Service is referred to as the "cloud" (SaaS). Even the Internet can be virtualized as a vast resource pool thanks to cloud computing technology. As a result, the cloud offers a very flexible option for significant industrial needs.

3.4 Control / Terminal Layer for Supervision

In the workshop, office, monitoring centre, and other areas, end- user devices like smart phones, desktop computers, and electrical boards were dispersed in the terminal layer. The output of cloud processing (4) was shown using terminal devices, which also provided remote operation and maintenance monitoring. Additionally, clients could use the intelligent terminal to view the order in real time. It links people to the smart business. With the terminals such as PCs, tablets, and mobile phones, people can access the statistics provided by the cloud, apply a different configuration, or perform maintenance and diagnosis, even remotely through the Internet. It connects individuals to the smart business. People can access the information offered by the cloud, apply a different configuration, or carry out maintenance and diagnosis, even remotely, using terminals like PCs, tablets, and mobile phones.

4. Role of Technology in Smart Business

This paper (Maddikunta, Praveen Kumar Reddy, et al, 2022) gives the role technology in various domains like the [4]

4.1 Intelligent healthcare

In order to diagnose patients ailments, doctors are now adopting ML models. This contributes to raising the accuracy of identification of illnesses, saving the patient a great deal of time and money. However, given the circumstances, this is insufficient. A technology that can guarantee a patient's unique needs, such as keeping track of blood pressure, sugar levels, etc., and providing patients receive individualized care with the help of the doctors is what the time requires. Patients with assistance from the doctors is need of the hour.

The advent of Industry 5.0 can enable this. Intelligent Smart watches, intelligent sensors, and other wearable technology Real-time data on the patient's medical care is continuously recorded, and thus The cloud can be used to store data. Then, ML techniques can be utilized to determine the patients' current state of health. These sophisticated devices have the ability to interact with one another, and if a doctor's focus is these gadgets can provide information on the patient's current condition when the medical staff to begin treating the patient. Doctors can use cobots to take assistance from communicative robots to help with performance giving the patients surgery.

4.2 Cloud manufacturing

By incorporating cutting-edge technologies like cloud and EC, IoT, virtualization, and service-oriented technologies, cloud manufacturing is an innovative technique to transform the traditional manufacturing paradigm into an advanced manufacturing process. Multinational stakeholders will work together in a cloud manufacturing process to run an effective and affordable manufacturing process. Reliability, high quality, cost effectiveness, and on-demand capabilities are distinctive characteristics of cloud manufacturing. Additionally, cloud manufacturing benefits the environment by removing the need for lengthy raw material deliveries during the manufacturing process.

4.3 Supply chain management

Industry 5.0-enabling disruptive technologies, such as DT, cobots, 5G and beyond, ML, IoT, and EC, when combined with human ingenuity and smarts, can assist businesses in fulfilling demand and delivering personalized and customised goods more quickly. This facilitates the integration of mass customization a major idea in Industry 5.0 into supply chain management.

4.4 Manufacturing

It is widely known that the advent of robotics and automation throughout previous technology revolutions led to paradigm shifts in the manufacturing industry on a worldwide scale. In the past, robots have performed dangerous, boring, or physically taxing tasks in manufacturing environments, such as welding and painting in auto plants, as well as loading and unloading bulky shipments in warehouses. As workplace devices become smarter and more connected, Industry 5.0 aims to integrate these cognitive computing capabilities with human intellect and resourcefulness in cooperative operations. Therefore, it is feasible that the fifth industrial revolution may bring about changes in standards and fundamentally alter our perspective on production and industry.

5. Trends in Smart Business

The performance of the current production systems significantly increases the benefits anticipated from smart production systems, according to this study conducted by (Jung Sungwook et. al., 2023) using Korean manufacturing small and medium-sized enterprises and structural equation modelling, which strengthens firms' intentions to adopt smart factories. It also concludes that the benefits anticipated from smart production systems are not much impacted by the top management's support for information technology. Furthermore, when businesses design their own production systems, the overall mechanism for adopting smart factories is enhanced. The findings of this study offer practical guidance to practitioners looking to convert conventional manufacturing processes into smart factories [5].

In order to improve Customer Relationship Management (CRM) in the E-commerce era, marketing methods have been modified for digital platforms. The most popular digital platforms (Kyaw Khin Sandar, et al., 2023) where customer data, including personal and behavioural data, flows as a huge data stream are e-commerce systems [6].

Even though adopting Industry 4.0 has many benefits for businesses in terms of higher production and lower costs, it also presents a number of problems. At the same time, a growing number of experts are beginning to express their worries about Industry 4.0 and talk about the emergence of Industry 5.0 with an emphasis on sustainability rather than productivity. These industries can make a seamless transition from analogue to digital systems with the aid of emerging technological technology. It is anticipated that industry 5.0 technologies would improve connectivity via the internet of everything.

Zeb, Shah, et al., 2022 the Industry 5.0 vision, a precursor to the next industrial revolution and an improvement over Industry 4.0, envisioned new objectives of resilient, sustainable, and human-centric approaches across a variety of emerging applications, such as future factories and the digital society [7].

Industry 5.0 aims for mass customized production with zero waste, minimum cost and maximum accuracy while a critical component in Industry 4.0 was mass production with minimum wastage and enhanced efficiency. However, the Industry 5.0 concept is yet entirely to be evolved. While mass production with little waste and increased efficiency was a key element of Industry 4.0. Industry 5.0 aspires for mass customised production with

zero waste, minimal cost, and maximum precision. The idea of Industry 5.0 has yet to fully develop though.

5.1 Human-Machine Interaction

Human machine interaction technologies, such as cognitive and affective computing, digital assistance, visual insights, smart management, and control, can enable the hyper-connectivity between machines and humans to provide human-centric innovation, solutions, and intelligence.

In order to provide intelligent solutions, Cognitive and Cyber-Physical-Social Systems (CCPSS), a rapidly expanding interdisciplinary technology, blends cognitive computing architecture at the intersection of three crucial machine/cobot areas. To enable human-machine contact, these three fundamental cobots environments include cyber,physical, and counterpart social (human) elements.

Intelligent Mobile Robots (AMR). Instead of the linear arrangement feasible with traditional conveyors, multidirectional production lines can be laid out by combining AMRs with AGVs. It comprehends how matrix productions fit into their surroundings. In order to give computer-generated perceptual information, augmented reality technologies, such as AR-VR-XR, merge virtual information with the real environment.

5.2 Real-time Virtual Simulation and Digital Twin

By developing virtual/digital representations of corresponding physical assets, such as devices, processes, sensors, etc., digital twin technology deployment enables the real-time cyber world. The following crucial two functional features are realized by DT technology. DT for Process and Physical Asset Optimization. By connecting the physical and digital worlds, DT models the complete complex system made up of deployed industrial assets, allowing them to interact and communicate intelligently in order to take action and maximize the output manufacturing process's multi-fold value.

5.3 Artificial Intelligence-native Smart Systems

These systems can recognise and anticipate incoming causalities in complex and dynamic industrial assets, such as cobots, business processes, worker conditions, and crucial events, which results in the automated actions that are required.

5.4 Bio-inspired Technologies

These technologies use biologically inspired sensors or communication devices to link people to industrial assets such as cobots. Technologies for embedded biosensor networks. Through embedded sensor networks (ESNs), which are mesh networks of sensorchips/nodes or computers with several sensors installed in the physical environment, any physical environment caninteract digitally.

The goal of the next industrial revolution, known as "industry 5.0," is to tap into human ingenuity. Professionals working with effective, intelligent, and precise machines to produce resource-efficient compared to Industry 4.0, and manufacturing solutions that users want. There are a lot of promising technologies. Applications should help Industry 5.0 deliver customized products and increase output. The possible uses of Industry 5.0, such intelligent Supply chain management, cloud manufacturing, manufacturing production, and healthcare. Subsequently, we talk about some Industry 5.0 enabling technologies, like edge computing, digital twins, Blockchain, Internet of Everything, cooperative robotics and 6G and beyondnetworks.

Alsudani, Mustafa Qahtan, et al., 2023 in this article the role of IoT or automated handling equipment will be encouraged to take the place of manual processes in the enterprise management system to handle repetitive jobs in smart logistics. Due to the frequent changes in customer needs, the synchronization of purchase orders to support production is essential to achieving on-time order fulfilment. Ineffective and incorrect order selection degrades order fulfilment. In order to give an advanced data analysis approach for Industry 4.0's smart logistics through global manufacturing, computational intelligence techniques are applied in the research [7, 8].

6. Challenges in Smart Business

Martinez Martinez, Adriana, 2023 focuses on the company's biggest problems with technological infrastructure are as follows: The business is enhancing its cybersecurity protocols, which are crucial for preventing

cyberattacks. Making sure that the oldest machines, analogue ones, can connect with digital ones is another difficulty at this time. The business has been working on converting the older equipment [9].

The most challenging task of AI is the data availability and fatigue due some technological error. AI are mainly applied to identify the fraud detection, customer data renovation, trading using social analytics, industry credit risk reporting, trading and auditing perceptibility etc. Secure the health care data, accessing the reliable information and e-governance are the big challenges in big data analytics. Data are in heterogeneous nature, uneven, isolated and hardly standardized. Incorporate the data from different sources are the most significant sensible problem in theeducation sector. One issue with Industry 4.0 is that all of the data in the cloud may not be secure, not be safeguardable, because industry-specific fully expert systems have not yet been built. The Industry 4.0 uses network theory and optimization approaches as mathematical tools [10-13].

7. Conclusion

In the above revealed challenges will be overcome and gives a better IoT will be the future. The industries and researchers try to improve their accuracy of forecast and developing ML based applications for solving various real- time oriented problems. Recent developments in AI methods collaborate with humans to analyze the complex data sets the ability of the machines regularize statistical analysis for analyzing the massive data sets. The data are from heterogeneous background, it generates reasonable explanations and suggestion for framing the new hypotheses. It seems essential that the society currently begin to think about the way to maximize its assistance. It can yield data from any source and investigate it by selecting a suitable AI method to find answers that enable cost reductions, time reductions, new product development and smart decision making.

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