

## A Review: Technical Road Map on Technological Advancement for the Factory of Future

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### Abstract

*Advancement of technology is essential requirement for any factory for sustaining in competitive environment. Therefore, some researches have been discussed to identify the best technologies for the betterment of factory. Automation, cloud computing, smart factory, ecofriendly manufacturing concepts can be utilized for the development of factory for the making it productive, safer and secure. Future of factory can be built by taking benefits from these technologies.*

**Keywords:** Automation, Cloud computing, Smart Factory, Future of Factory

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### INTRODUCTION

Factory development is essential for any profitable organization to achieve the target goal. Productivity can be increased by making the manufacturing process more standardized, more efficient and smarter, which can be achieved through the use of advanced technology. Rapid production and new product development can be faster and efficient by utilizing the advancement in technology.

Ghadimi, Pouya, Sami Kara, and Bernard Kornfeld have suggested that the renewable energy supply systems have potential to create tangible economic and environmental improvements for the manufacturing industry [1]. However, integrated energy supply and demand management is challenging due to the complex and dynamic nature of the problem.

In a period of abbreviated item life cycles and the noteworthy item changes, expanding item assortment and contracting conveyance times, survival in the market requests a venture to have deftness and adaptability. One course taken by numerous ventures is that of abbreviated arranging times and the adaptable design of the arranging procedure, which thusly impact the creation in a manner that a snappier adjustment to changing circumstances is conceivable and the time expected to bring an item onto the business

sector is abbreviated definitely [2].

In the unpredictable field of quick changing economic situations and diminishing consistency of business sector improvement, an industrial facility needs to adjust its generation limits rapidly and with negligible exertion [3]. Author suggests automotive production capacities, which will lead to improvement of factory performance.

So in this literature review, various papers have been identified and explored to share the knowledge about the scope of technologies for the future development, which can be implemented in factory by taking its productive advantages.

### METHODOLOGY

Betterment of factory in future depends on the advancement of technologies and scientific methods. Some of the advanced technologies are listed and explored to understand its benefits in future development.

### Advanced Technologies for Future

Some of techniques, which can be implemented in factory, are as follows:

1. Automation
2. Robotics
3. Flexible manufacturing system
4. Cloud computing
5. Green or ecofriendly process

## 6. Cyber security

## 7. Customized product development

Some of the literatures that suggest advance technology for the development of factory are as follows:

E. Carpanzano and F. Jovane described that new manufacturing technologies are needed because of continuously changing market demand [4]. The new advanced automation solutions which integrate all factory levels in a unique real time framework are compulsory. This automation system is applied to an innovative footwear factory to find out its benefit. The result shows that with the help of this system they can save time and effort.

Defang Li has implemented the concept of factory of future in the petrochemical industry [5]. The main objective of this paper is to give attention on next generation people oriented production and operation center so that they get benefit to corresponding knowledge and facility at proper time and place to innovate the business model. This paper presents about smart factory point of view of the integration of industrialization and IT applications. He also described that the smart factory which is different from the current production system used in petrochemical industry requires setting its future research framework. They have utilized the cyber physical systems (CPS) for petrochemical industries.

U. Bracht and T. Masurat have defined the concept of digital factory between vision and reality [6]. The purpose of this paper is to explain in a simple way how the vision of the digital factory can be implemented in reality and to highlight the problems which must occur in the future endeavor. They also suggest that many points on the topic of digital factory advise that not a single factory is capable of totally meeting this challenge. For this cooperation among companies and institutions will be necessary. In all of these efforts, the attention must be focused on the primary requirement of to maintain and ensure the viability of the company in future. Jan Woerner, Heinz Woern have developed new methodologies for computer supported co-operative development engineering CSCDE [7]. The concept of digital factory is necessary in near future for decreasing engineering time.

Gert Zulch and Tim Grieger describe the aspects of health and safety in the digital factory [8]. The objective of this paper is to describe a macro ergonomics occupational health and safety (OSH) approach to digital work system at the ifab institute. They apply principal of ergonomics at workplace in digital factories.

Gokan May, Bojan Stahl and Marco Taisch suggest research directions and solutions for eco factories in future. In this paper, they suggest the human participants in the manufacturing system further change towards eco factories [9]. They highlight the need to challenge such frames starting with a focus on how to increase intuitions for both the industry and academia to better operationalize the principles.

Chen, Toly and Min-Chi Chiu examined about the usage of cloud-based manufacturing plant reenactment [10]. Additionally say about the contrasts between cloud-based production line reproduction and parallel and appropriated processing plant reenactment. The issues in existing cloud-based manufacturing plant recreation frameworks are checked on the constrained studies in this field and proposed characterizing counterfeit neural system gathering way to deal with evaluation the ideal opportunity for mimicking an assignment on the web. Deciding the cost of cloud based reproduction administration for expansion the benefit CSP and urging industrial facilities to utilized cloud base reenactment administration. An exploratory cloud-based manufacturing plant reproduction framework was produced and utilized for reenacting a portable lift table production line.

Fahd Diab, Hai Lan, Lijun Zhang and Salwa Ali examined this paper to give a point by point achievability and a techno-monetary assessment of utilizing half and half photovoltaic, wind, diesel, battery framework to fulfil the electrical vitality requirements for a naturally amicable processing plant in New Borg El Arab city, Egypt and the city encompassing the production line [11]. Using the surely understood Hybrid Optimization of Multiple Electric Renewable programming to get the ideal arrangement of a half and half

renewable vitality framework, taking into account the client inputs of burdens, parts costs, segments specialized subtle elements, sun oriented and wind assets accessibility. Utilized Techno-financial investigation of the wind turbines and the force yield of the wind turbine in every time step is ascertained utilizing Homer programming. In light of the examination introduced in this paper, it could be presumed that the cross breed PV/wind/diesel/battery framework is a down to earth and practical answer for fulfil the electrical vitality requirements for an ecologically neighbourly production line in New Borg El Arab city, Egypt and the city encompassing the manufacturing plant. As per the reproduction results, utilizing the surely understood Homer programming, a cross breed framework comprising of 60 kW of PV clusters, 100 kW of wind turbines, 50 kW of force converter, 40 kW of diesel generators and 600 batteries with the limit of 589 Ah each is observed to be the ideal half and half framework setup as indicated by the NPC and COE.

Detlef Zuehlke has described the concept of smart factory [12]. Intelligent or smart device makes advancement in working conditions. Some of computer system integration with the factory makes it smarter and intelligent. Smart factory can make better planning and quality work. Higher safety and security can be achieved through the use of smarter systems in factory. Web manufacturing plants structure the errand of making and overseeing application-particular overlay systems utilizing foundation as administration mists [13]. We portray the Internet production line engineering and give an account of a proof of idea with three cases that continuously represent its working. In one of these cases, we exhibit the formation of a 163-hub IPv6 system more than 18 cloud areas around the globe. Web plants incorporate the utilization of libraries that catch years of experience and information in system and frameworks building. Therefore, Internet industrial facilities tackle the issue of making and overseeing on-interest application-particular overlay systems without uncovering every one of their intricacies to the application designer. Web Factories permit designers to re-use years

of experience and learning in system and frameworks building by means of programming libraries. We likewise indicated three common examples to make UPVNs utilizing base as-a-cloud administrations. The assessment of three Net apps and the striking systems they created underlines the configuration and designing force of Internet manufacturing plants. Moreover, our utilization of framework as-an administration mists exhibits how UPVNs can utilize the physical Internet and how programmable system components and systems can be a piece of the Internet regardless of the possibility that system administrators do not encourage the programming of their Internet switches. We imagine that our utilization of Mathematica just mirrors the look at cutting edge frameworks conduct that can be made. We expect that expansive and complex ICT frameworks, for example, digital physical frameworks, future systems and ICT frameworks to bolster savvy urban areas are prime possibility for applying our outcomes. As Internet production lines demonstrate to develop complex ICT frameworks, our centre will move to the era of cutting edge conduct and administrations of these frameworks.

Existing methodologies of growing new items are evaluated, and another way to deal with create items for variable learning production lines is displayed and accepted by a contextual investigation [14]. The new advancement methodology is committed to alterable learning fabricating frameworks by picking a product offering among numerous possibilities to suite the learning framework abilities and craved learning results. Outlines for item variations that suite the learning plant and arranged learning situations and preparing knowledge. This paper concentrates on learning production lines for variable assembling frameworks, which are built to have the vital variability empowering agents, for example, portability, particularity, adaptability, all-inclusiveness and similarity. It is trying to partner learning and research to an alterable assembling framework. Items are composed and created to satisfy craved capacities amid use and their assembling framework is resolved by elements and configuration determinations. On account of

existing learning industrial facilities, the criteria are distinctive including imperatives forced by the current office and its capacities and additionally extra necessities for simplicity of dismantling and re-use. These vital contrasts were plainly shown in this study. Since the results of the trials on an alterable learning industrial facility would cover the extensive range of conceivable item variations and generation situations, a particular situation in the genuine processing plant would be a subset of that range with respect to framework design and format, execution parameters, and so forth. Taking into account the audit of best in class of existing methodologies for item improvement, another methodology for creating items for variable learning plants was produced. It incorporates the important stages and ventures to outline new items and their variations considering the learning framework capacities and the targets of learning manufacturing plants including the detail of procedure and format arrangement situations.

The Working Group on Industry 4.0 exhibited an arrangement of usage proposals to the German government [15]. The term Industry 4.0 starts from a task in the cutting edge methodology of the German government. Such venture advocates the computerization of the assembling business. It is otherwise called the fourth modern upheaval. Unequivocally, industry 4.0 depends on the innovative ideas of digital physical frameworks, Internet of Things (IoT), which empowers the Factory of the Future (FoF). Inside the particular organized savvy plants of Industry 4.0, digital physical frameworks screen physical procedures, make a virtual duplicate of the physical world and settle on decentralized choices. Over the IoT, Cyber-physical frameworks convey and participate with each other and with people continuously. Undertaking asset arranging (ERP) frameworks are viewed as the spine for the Industry 4.0. The current writing on FoF concentrate primarily on specialized issues, e.g., machines self-rule, small scale controllers and other digital physical difficulties. There is a crevice in writing on the business side of FoF. In particular, association related difficulties, business cases, change administration, plausibility and speculation

defense. While they put stock in the numerous advantages of the FoF, in any case, our objective cases recommend that this change from a conventional industrial facility to a keen plant is hard to achieve. The witnesses trust that the 'to be set up' future production lines have more edge to receive FoF advancements and belief systems. Also, it could be all the more monetarily achievable for them. Additionally, the outcomes demonstrate that FoF may be more helpful in a few commercial ventures over others. In this way, more research and business cases are expected to affirm or invalidate these outcomes. Then again, while ERP frameworks are viewed as the spine for the fourth modern transformation, nonetheless, there is likewise a crevice with regards to ERP preparation for FoF. In view of the outcomes exhibited in this study, ERP frameworks are considered as innovatively and operationally prepared for this transformation.

This paper reviews the utilization of descriptive word smart in admiration to innovation ad with an uncommon accentuation on the keen manufacturing plant idea position among contemporary studies [16]. Because of an absence of an agreement of regular comprehension of this term, a bound together definition is proposed. The conceptualization will not just allude to various smart industrial facility dreams reported in the writing; additionally interface the significant qualities of this developing assembling idea to regular assembling practice. Subsequently, the writers talk about the difficulties of the potential brilliant production line applications in SMEs, furthermore propose a future examination standpoint with a specific end goal to further build up the savvy processing plant idea. This paper puts a unique spotlight on the savvy mark with respect to production line and expansion of the idea. Receiving a steady meaning of shrewd production line, and expanding upon it, would help to accelerate our comprehension of this developing way to deal with future assembling. We trust that our gathering of existing brilliant processing plant dreams, alongside establishing it in the conventional assembling speculations, will help us move in this course as a group of researchers. So far the savvy plant is only an extraordinary disclosure of future

improvements in assembling facilities. The idea still needs to advance before completely achieving its down to earth application in a mechanical generation set up.

Jean-Claude Charpentier described that limitations require an incorporated framework methodology of complex multidisciplinary, nondirect, nonharmony procedures and transport wonders happening on the distinctive time and length sizes of the concoction inventory network, which implies a decent comprehension of how marvels at a littler length-scale identifies with properties and conduct at a more drawn out length-scale, from the atomic and dynamic totals scales up to the generation scales [17].

The accomplishment of this coordinated multiscale approach for procedure advancement is fundamentally because of the impressive improvements in the explanatory exploratory systems combined with picture handling, in the effective computational instruments and abilities (bunches, supercomputers, cloud PCs, realistic preparing units, numerical codes parallelization and so forth.) and in the improvement and use of enlightening models of relentless state and element conduct of the items at the size of interest. To diminish essentially the expenses of a gas treatment process or a CO<sub>2</sub> catch prepare, a few sorts of recreations can be utilized. As a matter of first importance, a brisk techno-temperate study performed with appropriated recreation device can be utilized at procedure worldwide scale to show how capex and related segment plans are vital. Second, prepare reproductions (taking into account thermodynamics, energy and mass exchange) can be utilized to recognize the most imperative drivers that control the configuration of the retention sections. Last computational liquid elements (CFD) recreations can be performed to decide stream attributes in the pressed segments. CFD is utilized with a few methodologies, from little scale to extensive scale through mesoscale. For instance, CFD can be utilized at little scale for gas/fluid volume of liquid (VOF) re-enactments, and at section scale for examining passageway impacts. The mix of every one of these reproductions, performed in two-way

coupling philosophy, takes into consideration deciding ideal plans and fitting decisions of pressing and dispersion innovations. The task tries to the coordination of the most recent modern computerization frameworks for gathering operations, in blend with human capacities. Centre is given to joining robot quality, speed, consistency, repeatability and exactness with human insight and abilities to get at a half and half arrangement that would include the sheltered collaboration of administrators with independent and adjusting automated frameworks [18]. The fundamental empowering agents are: the improvement of natural interfaces for safe human-robot participation (HRC), the utilization of wellbeing methodologies and hardware, permitting fenceless human robot get together cells, the presentation of strategies and apparatuses for the proficient arranging programming and execution of get together operations, and additionally the utilization of versatile robots, going about as collaborators to human administrators. The task additionally gives a more adaptable combination and correspondence engineering by using an appropriated processing model alongside cosmology administrations. This paper has exhibited the visualized half and half generation worldview that is sought after by the EU venture robopartner. The required programming and equipment advancements have been sketched out alongside the potential advantages by their reception. The preparatory assessment has shown noteworthy investment funds regarding efficiency (17% cycle time decrease) and administrator's working conditions (25% less undertakings, less physical interest) [19].

## CONCLUSIONS

Technological advancement is essential for the betterment of factory. Various researches have been recognized to identify the advanced technologies for factory development. Some of the authors have described the concept of smart factory, which can be the key technology to get the benefits of security, safety and quality improvement. Many authors have suggested the implementation of ecofriendly process for the sustainability development. Few papers deal with the web based technologies, which will speed up the

process and communication, and cloud computing, will make the data management easier than ever be. Therefore, implementation of these advanced technologies will change the future of factory by making it more efficient, safer, secured and productive.

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