Review on Adoption of Advanced Production Technology

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Abstract- *Effective makers will move rapidly from weighing up and looking at changed advances for the best business case to installing the innovation in their vision and building up a way for the excursion from vision to esteem. Makers will progressively embrace a lean way to deal with advancement with a brisk progression of ideation, prototyping and scaling-up stages. The transformative capability of innovation underway frameworks is generally perceived, even while the exact arrangement and degree of the conceivable change stay obscure. Patterns towards more elevated amounts of robotization guarantee more noteworthy speed and exactness of creation and additionally diminished introduction to perilous assignments for workers. New generation advancements could help conquer the stale efficiency of late decades and clear a path for more esteem included action.*

So the motivation behind this paper is to survey the all conceivable and present day innovation of the generation that can be pertinent to the organizations and exploit from these. These all technique are helpful however the constraints are additionally considered as fundamental point.

Keywords- IoT, Advanced Robotics, Artificial Intelligence, Wearable innovations, Barriers to appropriation.

I. INTRODUCTION

The transformative potential of technology in production systems is widely recognized, even while the precise configuration and extent of the possible transformation remain unknown. Trends towards higher levels of automation promise greater speed and precision of production as well as reduced exposure to dangerous tasks for employees. New production technologies could help overcome the stagnant productivity of recent decades and make way for more value-added activity.

II. THE INTERNET OF THINGS USE IN PRODUCTION

IOT is regularly introduced as an upset, yet it is really an advancement of innovations grew over 15 years back. Operations and mechanization advances are currently mixing, though moderately, with sensors, the cloud and availability gadgets of the data innovation (IT) industry Information Handling Services (IHS) ventures the quantity of those gadgets to develop to very nearly 80 billion by 2025, up from 17 billion today.4 The prompt open doors for makers are in savvy endeavor control, resource execution administration progressively and keen and associated items and administrations. Digital security and interoperability challenges are upsetting makers from grasping IoT on the processing plant floor and in their supply chains, with 85% of advantages still detached. The web of things (IoT) – the installing of physical gadgets with sensors, arrange network and different segments so they can gather and trade information – is regularly exhibited as an unrest, yet it is really an advancement of advances grew over 15 years prior. Amid the most recent decade, sensor costs declined twofold, transfer speed costs fell by a different of 40 and handling costs dropped by a various of 60. The diving expenses of detecting advances, improved processing power, propels in information availability in the cloud and machine-to-machine correspondence are joining to drive the union of beforehand isolate generation advances – IT, operations innovation (OT) and robotization innovation (AT) – to make the fate of creation, extended from the plant floor to associated items, administrations and supply chains – the mechanical web of things (IoT). Figure 6 represents how this procedure has been under route for a very long while, and is currently quickening because of quickly propelling abilities. IoT stages are as yet developing and there are no evident victors in this space. Adversary innovation organizations making contending stages are focusing on numerous mechanical segments.

Advocates of IoT feature its capability to change generation, not just by changing operations on the shop floor, yet in addition by empowering end-to-end perceivability over the store network continuously, the distance to the end client, and also growing new items and administrations to clients. IoT interest underway is relied upon to twofold from $35 billion to $71 billion by 2020, with three key capacities driving ventures: resource following, condition-based support and apply autonomy preparing. North America drives today are IoT reception. In any case, the Asia-Pacific area is anticipated to have a bigger piece of the pie by 2020 (in overabundance of $2.5 trillion).

IoT has three unmistakable uses in the present generation frameworks:

Smart endeavor control

IoT advancements empower tight combination of shrewd associated machines and savvy associated producing resources with the more extensive endeavor. This encourages more adaptable and proficient, and henceforth gainful, generation. Keen undertaking control can be seen as a mid-to long haul incline. It is unpredictable to execute and will require the formation of new norms to empower its merging and OT frameworks.

Asset performance management

Deployment of cost-effective wireless sensors, easy cloud connectivity (including wide area network or WAN) and data analytics improves asset performance. These tools allow data to be gathered easily from the field and converted into actionable information in real time. The expected result will be better business decisions and forward-looking decision-making processes.

A. Augmented operators

Future employees will use mobile devices, data analytics, augmented reality and transparent connectivity to increase productivity. As fewer skilled workers are left to man core operations due to a rapid increase in baby boomer retirement, younger replacement plant workers will need information at their fingertips. This will be delivered in a real-time format that is familiar to them. Thus, plants will evolve to be more user-centric and less machine-centric.

III. ARTIFICIAL INTELLIGENCE (AI)

Enables producers to make sense of the overwhelming data that their factories, operations and consumers generate, and to transform that data into meaningful decisions. Today, 70% of captured production data goes unused. Applying AI to the connectivity of IoT, producers are able to orchestrate and streamline business processes from desktops to machines, across department walls and tiers of suppliers. The most promising immediate opportunities for applying AI in production systems are in quality management, predictive maintenance and supply chain optimization. AI-enabled products will be a game changer for value propositions addressed to customers, and producers must be ready to orchestrate the value networks required to deliver these. The analytical engine powering all aspects of the connected economy is transitioning from rigid rule-based algorithms to flexible, intelligent ones. These are solutions that learn and evolve on their own over time, with the appropriate training data. Machines no longer simply answer the questions posed by people; they guide people to ask better questions in the first place, and offer faster and more insightful answers. This transition to AI, or machine intelligence, will profoundly affect both the nature of consumption and the structure of firms, supply chains and production. AI technologies could fundamentally impact society, along with jobs, wealth distribution and resource sustainability. Major technology companies are heavily increasing their mergers and acquisitions activities to improve their products and services, using AI solutions.

AI has achieved recent performance breakthroughs across numerous cognitive applications, from image classification to pattern recognition and ontological reasoning. This progress is due largely to convergent advances across three enablers: computing power, training data and learning algorithms. To illustrate this, automated image recognition and classification has improved in accuracy over the past decade, from 85% to 95% (a human averages 93%),10 allowing such algorithms to progress from being novelties to enablers of real innovations, such as autonomous transportation for warehouse order picking. Solutions are currently trained on millions of image data, a 100-fold increase compared with a decade ago. They are powered by specialized graphics processing unit chips that are more than 1,000 times faster, and five to ten times more complex (based on a 150 to 200-layer neural network) than those of previous generations. Computing and storage costs have declined commensurately by an average of 35% year on year.11 In the near future, AI will build on adoption enablers to unlock faster, smarter and more intuitive applications, although progress will probably be confined to broad adoption of narrow, context-aware intelligence across domains. The chasm separating narrow and general intelligence is believed to represent a fundamentally different set of learning algorithms and non-deterministic computing architecture compared with what exits currently. Natural language processing can be adopted to create task-specialized personal assistants, as well as platforms for conversational technologies that can be provided as a service and integrated in various applications. Computer vision capabilities enhance visual navigation for self-driving cars as well as 3D scanning. Pattern recognition can identify customer preferences and be deployed to aid drug discovery. AI reasoning and optimization technologies are penetrating the value chain in various industries, such as the automotive sector, and currently inform 75% of consumer picks on Netflix. AI is used to optimize the multi-robot fulfilment system in Amazon warehouses

IV. ADVANCED ROBOTICS

Have long handled the "dull, dirty and dangerous" jobs, and currently automates 10% of production tasks. Robots were often separated from people for safety reasons, but now, a new generation has "come out of the cage" for 24-hour shifts, working alongside human counterparts. Increasing returns on investment, insatiable Chinese demand and advances in human–robot collaboration will increase their adoption to 25-45% of production tasks by 2030, beyond their use in the automotive and electronics industries. Adopting advanced robotics and AI could boost productivity in many industries by 30%, while cutting labour costs by 18-33%, yielding a positive economic impact of between $600 billion and $1.2 trillion by 2025.

Of the many digital technologies driving progress in the Fourth Industrial Revolution, advanced robotics has already shown that it can significantly alter the entire value chain. An estimated 1.8 million industrial robots are operating in global production systems today, representing a global market of approximately $35 billion. Penetration is markedly pronounced in Asia, with China being the largest robot market in the world. Robotic capabilities are still increasing while costs continue to fall (by about 25% over the last decade), allowing smaller factories to achieve increased outputs. Greater robot flexibility and intelligence supports proliferation across industries where they have not been deployed traditionally, including food and beverage, consumer goods and pharmaceuticals. The electronics sector is currently a significant driver of robot sales.

However, the impact of any given technology cannot be observed through an operational lens alone. A balance of fostering innovation and having appropriate regulations is required to ensure that robotic technology continues to progress and provides the widest possible societal and economic benefits.

Use in production. The ambition is for robotics to become collaborative, intuitive, self-monitoring, agile and relatable, exhibiting human-like characteristics. Ultimately, the vision is to "un-cage" robots, enabling them to move on from being traditionally separated from people for safety reasons and allowing them to work alongside their human counterparts. Sophisticated vision systems can lead to higher robotic self-awareness, by improving workplace safety in a collaborative robotic environment. Improved gripper technology that more closely mimics human hand function will greatly increase the functionality of robotic end effectors. In addition, enhanced machine-learning capabilities will harness AI and allow for improved recursive manufacturing processes.

Within production applications, handling has both the highest number of units installed in 2014 (almost 40% of the 1.7 million) as well as the highest annual growth rate (11% compound annual growth rate [CAGR] for 2010–2014), with packaging, picking and placing dominating the process usage for handling. The second biggest application is welding, primarily driven by countries that are also major car producers (China, Japan and USA). Assembly applications are another fast-growing segment (10% CAGR 2010–2014) due to an increase in electronics/electrical industry products decreasing in size and a need for increased precision quality.

Public discussion about adopting robotics is inextricably tied to the future of employment. One of the key rationales for using robotics in production is its growing ability to perform dull, dirty and dangerous operations. Moreover, the drivers for adopting advanced robotics are rapidly overcoming barriers to implementation. Removing people from these operations could create a safer workplace, with companies able to redeploy workers to higher-value tasks on the shop floor. Across the supply chain, robotics and automation could bring exceptional efficiencies that are increasingly vital to maintaining or increasing a company's competitive advantage – so much so that a company failing to embrace these advances might go out of business entirely. Another key point about the impact on employment is that adjacent industries, both existing ones and those not yet foreseen, will continue to create new jobs along the production value chain. Among robotics' other benefits in a digital economy is a connected, synchronized supply chain that enhances the ability to react to changing consumer demands and to produce "just in time". Moreover, robotics offer a major impetus to the changing mindset of moving from large manufacturing facilities to smaller, more localized manufacturing that is closer to demand.

V. WEARABLE TECHNOLOGIES DIGITIZE THE WORKFORCE

The basics Technology for augmented reality (AR) and virtual reality (VR) could become the next computing platform, following personal computers and smartphones. In the specific case of production, AR and VR could enable people to thrive and harness their capabilities more fully.

These technologies fundamentally shift the way that information is relayed to the user, offering immediate access to critical data. Distinct enterprise applications are now emerging across a variety of wearable technologies, with more of the human senses being tapped. Wearable's, AR and VR present valuable use cases for quality inspection, work instructions, training, workflow management, operations and safety, logistics and maintenance. Producers of all three are now preparing the technologies for accelerated adoption and the most effective implementation possible. Early adopters are proliferating across many industries, including construction, automotive, logistics, aerospace, industrial equipment, mining, oil and gas.

Use in production. One of the key value propositions for Wearable's in the context of production is that they can offer value across multiple value dimensions (Figure 9). Wearable's can help to improve margins through increased output, with further productivity improvements due to increased accuracy. Their astute deployment can reduce safety incidents. Quality variation can be pared down through reductions in downtime, defects and waste, while simultaneously reducing lead times. Design augmentation by means of Wearable's can reduce product lead times and R&D costs, while improving product reliability and providing a more efficient manufacturing process.

A particularly persuasive value proposition for Wearable's focuses on enhancing training and reconfiguring how the workforce acquires new skills. Demographics are fundamentally shaping the future workforce of production. The average highly skilled US manufacturing worker is 56 years old, while in India, 10 million young people enter the labour market every year. For many global producers, the growing priorities are to upskill talent and to quickly and effectively pass the knowledge of experienced operators to young talent that is often lacking relevant factory-floor skills. In the past, operators were taught by using a paper-based manual or flat human-machine interface visualization screen. Now, with AR and VR programmes, the worker can be fully immersed in the environment. With these enhanced training platforms, the workforce itself can be more flexible and configurable.

VI. BARRIERS TO ADOPTION

A. Barriers to adoption of IoT

IoT take-up is still nascent and has not occurred extensively anywhere in the world. Currently, 85% of potential assets remain unconnected and several barriers need to be overcome by governments and companies to enable widespread adoption, most notably the establishment of industry standards around IoT and cyber security protection. Standards are required to allow smart connected products, machines and assets to interact in a transparent fashion. This goes beyond the simple communication protocols, and involves the creation of standard semantics and mechanisms that will allow smart devices to discover each other and interoperate. Security needs to be built in industrial control systems and designed into the components that make up the automation system, not added on later. The adoption of industrial security standards with certification will be essential to the advancement of IoT because it will ensure the security not just of individual assets but also of the larger systems and systems of systems.

B. Barriers to adoption of AI

Key ethical, regulatory, legal and economic questions about AI remain, and these may hamper its ability to become main-stream. Concerns about cybersecurity are a further critical issue in adopting AI; moreover, cybersecurity, as an industry in itself, will need to expand in tandem with AI and analytics (and IoT), to address inevitable vulnerabilities

C. Barriers to adoption of advanced robotic

Three key barriers obstruct widespread adoption: technology constraints, high costs of implementation and workforce limitations. This technology needs improvements especially since it relates to advanced vision and gripping systems and connectivity to "feel" and "work" in unstructured environments. Some firms are fearful of adopting a rapidly evolving technology before it is maturefor an industry or application, which can delay investment decisions. High investment costs could prevent many emerging economy small- and medium-sizes enterprises (SMEs) and firms from implementing robotics solutions. The average cost for a spot-welding robot is projected to decrease by 22% by 2025 and robots-as-a-service models are beginning to appear; however, additional progress is needed to reduce the costs of the robots, supporting infrastructure and implementation. Additionally, at the workforce level, the fast evolution of robotic advancements will outpace the workforce skill level. In many cases, a lack of educational programmes and a shortage of the required technical skills sets pose significant barriers to implementing robotics successfully. Human acceptance of robotics and the allowance of collaboration can further stifle their adoption.

Several enablers working in conjunction have the ability to influence the tipping point for advanced robotics. These include government incentives and standards, education and workforce training programmes, decreasing costs and technology improvements in advanced vision systems and gripper technology, and integrated design learning.

D. Barriers to adoption of Wearable technologies digitize the workforce

While Wearable's have some compelling value propositions, companies must deal with numerous factors when considering whether to adopt them for their enterprises. Potential end-users are typically interested in four main issues regarding Wearable's, AR and VR. One is the appropriateness of the technology; industries with a high labour cost or high cost of mistakes have the greatest potential to achieve a significant return on investment with these technologies. Job functions with strong opportunities are those in which people use their hands, yet need information to proceed.

Another concern is the timing of adoption. The technologies are continually becoming faster, lighter, safer, more efficient, more affordable and more comfortable.

VII. VALUE TO THE FIRM

In addition to value in factories, new technologies create value for firms through four levers: smart innovation and engineering, digital orchestration of the supply chain, delivery of smart and customized product offerings and innovation of business models. The impact on firms can occur in three stages:

First, the use of technologies to bring their factory and supply chain operation costs down. They will use many of these technologies in their existing business models.

Second, new business models will evolve, driven mostly by a shift from products to services, ecosystems and long-term relations between producers and consumers.

Concomitantly, this transformation will require companies to adapt their strategy and leadership philosophy to embrace a new digital way of thinking and ready themselves for the new choices (e.g. global production footprints, investments) and risks to which this integration will expose their companies (namely cyber-risk).

VIII. CONCLUSION

Technologies compel producers to invest in and transform their operations, business models and culture; not doing so would risk their firms' long-term prospects. The rationales for business to invest in new technologies include getting products to market more swiftly, improving efficiency and productivity, differentiating product offerings and, crucially, making better products. The demonstrable benefits brought by new technologies mean their deployment is inevitable. Most large-scale producers have already contemplated and experimented with technologies through pilots. They will increasingly move from "visioning" and experimentation to full scale transformation and implementation of the digital and technology agenda to create value.

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