Fundamentals of an Industry in 2035

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Currently, the industries are transitioning from industry 3.0 to industry 4.0 in which they are just beginning to understand the relevance of AI and further getting introduced to cyber-physical systems. They are continuing with manual and conventional techniques to manufacture less efficient products, which is ultimately more time-consuming and expensive. They do not have the resources to use robust engineering design techniques for designing parts and components and hence, the end products are not as dependable. Companies are ignoring the deteriorating impact that they have created on the environment. The companies that will keep sustainable development as their priority will survive in the long run. The existing management skills which the manufacturing companies are following are ineffective against the techniques of the future. In the future, the management techniques will use AI and Big Data to make decisions and plans. The present industrial atmosphere is not conducive to learning and the employees in the industries are resistant towards change and so, this behavior can become detrimental to the company and their employees in the future. A trend has been observed wherein the rate of new technologies coming into the market is increasing significantly. It is observed that in the past, shifting from one manufacturing technique to another took at least 50 years to implement, however now, it just takes around 5 years to do the same. It can be predicted that in 2035 this rate of shift will be much faster. Thus if the company does not keep up with research or create new products, it will become obsolete in the market.

Looking into the future, numerous hurdles need to be identified pertaining to the company's specifics. The identification process will look into minute details on the current operations and logistics, partnerships, change in technology, and the present and future economy. These research challenges must be envisioned and detailed in order to find distinct and determined solutions. Some of the research problems that a manufacturing company can face in order to maintain its position as a high global enterprise in 2035 can be as follows,

1) Introduction of the fourth wave of AI

In the fourth wave, machines working on AI will be able to sense and respond as humans do to real-world situations. Industries will have to modify their work culture, and structure to accommodate AI into their atmosphere. The company needs to figure out the best approach for achieving high performance by using AI-based technology.

In the fourth wave, AI will be able to manufacture goods, design components, create business strategies, consult with humans, and make decisions leading to more profit. Limitations of AI to a certain extent are unknown and, hence, need to be thoroughly researched. Another important research challenge for a successful AI is to identify the problems that it can solve and thus take action towards the solution.

One of the biggest challenges that researchers will face is how to effectively ensure that employees and AI machines work together in unison. The company needs to look for ways to guarantee that employees are comfortable with this new change. Additionally, they must introduce a cohesive training program to educate employees to be able to easily interact with AI machines. Vice-Versa, it needs to be ensured that AI machines are capable of understanding the human language.

2) Introduction to industry 5.0

In industry 5.0 the AI machines will work hand in hand with humans. The company will have to expertly divide the work between their employees and machines, and additionally, new techniques need to be introduced for efficient interaction. Employees may be reluctant to adapt to the change in technology, therefore, a good training session or course needs to be conducted. The transformation of an industry from the fourth to the fifth generation is an important hurdle that needs to be overcome, and this transformation must be done in the most effective manner.

3) Push towards Sustainability

The advancement of industries has made an adverse impact on nature. Many environmental crises have emerged due to the current industrial policies. Therefore, in 2035 the company needs to comply with the guidelines issued by the United Nations Organization for sustainable development. The first challenge that it will face is to create less waste and pollution and thus, figure out methods by which waste products can be recycled and reused.

4) AI's role in the management

In 2035, new companies will use advanced management policies to sustain themselves in the market. The competition of survival will become complex and it will not be able to survive by using conventional management techniques. Therefore, companies need the assistance of AI and ML to devise management strategies. Companies need to constantly collect a huge amount of data and analyze it proficiently to make important decisions for the company's growth and prosperity.

5) Experts of the different field will be required

The technology in each and every sector is improving and growing. New fields of technology such as quantum mechanics, AI driven manufacturing are coming up. In the future, a product will be made of many parts which will be associated with many technological fields. Therefore, to keep up with the competition of the future market, the companies will need to focus on every technology sector that is required in their company.

6) There will be people of many technology fields working for one product

In the year 2035, one manufacturing process will include experts from many fields. For example, mechanical engineers, computer engineers, electronics engineers, economists, marketing person, and many more will be working together. Everyone will be an expert in their own field, but they will not know the ways in which they can communicate with each other. Therefore, the companies will have to think about techniques to integrate all these personals.

7) Experts and consultants could be at remote places, and difficult to reach

In the future, the companies will be in the need of many experts and consultants as their products will be having components or parts from various engineering fields. The company would be

needing an expert in a field that is staying far away from their place. In this case, the company needs to learn how to use employees and experts from a remote place.

Research challenges form the basis on which the company stands. Beyond this, the mode of operation of the company is examined in order to recognize shortcomings present. It must be strong and reliable. The dynamic nature of it calls for continuous evaluation and strengthening. The following are few modes of operations that could be new in the year 2035

1) The synergy between machines and humans

Currently, industries face discontinuity in communication between machines and personnel. This arises problems with regard to poor productivity and ineffective workflow. However, in 2035 the synergy between machines and humans will pave the way for effective communication and a shared knowledge base wherein decision making and critical thinking will improve significantly.

As time progresses AI will soon be able to play a role in aiding human's critical thinking and decision-making tasks. With enough experience and the advanced technology present, AI will be capable of disserting human emotions and behavior and further will be able to interact with humans. This will be the time wherein we rely on artificial consciousness which will be more effective in completing targets. Dependency on AI is inevitable and the sooner the company focuses on improving its AI system, the faster it will grow in the market.

2) Research and Development will be an integral part of an industry

Immeasurable and unquantifiable problems will frequently surface, and hence, the need for constant advancement in technology is necessary for the survival of a company in the competitive market. Research and development hold an integral role and the key to knowledge is continuous, dedicated research in upcoming fields. Applying a unique methodology will give the company an advantage over others, and hence ensure a growing pace in the market. Another important research objective is to find a sustainable source of power that the company itself can produce and hence reduce dependency and have an economical advantage.

3) Product customization

Regardless of the companies standard products, there will be a market need that caters specifically to the person. This trend of product customization is rising rapidly and needs to be sufficed. Eventually, the customer's needs and wants need to be addressed for a company to survive in this market.

In the future, the customers will desire products that will be complex in design, and which will require a composite of unique materials to be manufactured on. These personalized products will not be made by conventional manufacturing techniques, and hence flexible manufacturing techniques need to be implemented at a larger scale.

4) Machine integration

The current trend of manufacturing involves products being made by different machines, and this will soon change, as machines become more complex. Rather than using various machines, a single machine can be relied upon to perform all the various tasks. This will save space, cost, downtime, energy requirements, and inventory.

5) Incorporating additive manufacturing

In conventional manufacturing techniques, generally, the metal is removed from the raw material, and because of this energy is wasted. Nowadays, additive manufacturing is becoming more popular as there are multiple research advances in this field. Additive manufacturing is also cost-effective as it does not waste material, and the products made from this technique are very accurate. Hence, in the future, the manufacturing company needs to incorporate additive manufacturing into their units.

6) Ready for change

Change is inevitable and rather than being afraid of the rapid advancement in technology, it is in the company's best interest to embrace these changes with an open mind. Change is often accompanied by threats, however, it is crucial for a company's growth to overcome the challenges that are presented.

Although this change will lead to less dependency on man-force, it is necessary to ensure that employability increases to sustain a comfortable life for the masses.

7) Decentralization of different technology sections

A single manufacturing product will be made from components of various technology branches. In that case, there will be no one expert who can consult everyone. The company needs to bifurcate the company departments into many parts according to technology sections. By doing this, each and every section will work to its full potential

8) Implementing systems engineering

In the year 2035, there will be many technology sectors, and experts working differently. Everyone will be an expert in their field, but they will not know how to coordinate with each other. In this case, a systems engineer will be required to bring everyone together, and make a single product. Systems engineering is a field of engineering and engineering management that focuses on how to design, integrate, and manage complex systems. A robust systems engineering network will be required by the companies to implement.

9) High scale use of Internet of Things

The company may find some of its experts in some remote areas. In this case, the companies must implement IoT at a larger scale, so that an expert at one place, can design a product, and the product can be made in some other place. IoT will also help multi-national manufacturing companies, who can have designers and researchers in one place, and manufacturing hubs in many places. This will not only save time, but also increase their profit, and help them to expand in the market.

In 2035 high-tech global companies will face new and unprecedented challenges which weren't initially anticipated. So advanced technology, unique techniques, and new state-of-the-art companies will be born at a much faster rate. Companies and their employees need to ensure that they have the ability of quick learning and flexible adaptability. The emerging trends in the manufacturing units indicate that there will be a quick shift from trial error testing to a more robust simulation-based approach which will yield more productive results, and be more cost-effective. In order to become a successful high-tech global design and manufacturing company in 2035, the company must have the following characteristics,

1) The company must have flexible manufacturing machines that can manufacture customizable goods at a faster rate.
2) The company needs to invest in digital twins and digital threads, and create and test products on a virtual background first before manufacturing them. This will save the company time, money, and effort.
3) A good work culture with mutual understanding and compliance between the human and machine
4) The company must adapt to new technology easily without a period of extended downtime and unproductivity.
5) The company must invest in research and development in order to create innovations to sustain competitively in the market
6) The company's priority should include a more need-based sustainable methodology pertaining to the current environmental conditions
7) The company must aim at adding value to societies
8) A distinct approach towards marketing and management will be necessary to promote and distribute the product globally keeping in mind different cultures and requirements.
9) The company will have a robust decentralization policy that helps the experts of a specific domain to flourish, and systems engineering, to help these experts to come together.
10) The company will use IoT to easily handle the people and machines at different branches, and outlets.

As the industry is expanding, there is only so much that an individual company can do. A form of bond or partnership is essential to broaden its hemisphere and provide for a larger market. In the future, the companies need to build up strategic partnerships with other companies in which their deed of partnership is clear. The company will have to share a high amount of data along with resources with the partner. The partners will need to think about customer satisfaction along with earning profit.

The company needs to build up partnerships such that they are able to also share technology amongst them. As technology is becoming complex, it will be difficult for one company to have all the technical advantages. Hence, to survive in the competing market, the companies will need to borrow technology from trustworthy partners, and also share their own expertise.

The companies will also need to form a partnership in which the partners will need to integrate their resources to achieve their own individual tasks. For example, a software company will have to work shoulder to shoulder with a hardware company. This is happening currently, where the

software of a robot is made in one company, and the hardware of robots like arms, wheels, and circuits are made by some other company.

The company will need to have new forms of partnerships with research universities and scientific institutes. It must invest in university research projects which are related to their domain because by doing so, they could attain eccentric research and novel ideas at a relatively low cost. The companies should take advantage of the knowledge that Professors and Researchers in universities have, they tend to create things that are ahead of their time, and hence must be followed carefully. Companies can also hire university students in the lieu of internship opportunities in order to stay advanced and competitive in the market.

The companies will also need to form a strategic partnership with international organizations and companies in order to penetrate the market of other countries. The supply chain in the future will be more robust, but, to survive in a supply chain industry, which tends to be competitive, the companies will require expertise in this field. In the future, there will be companies whose sole purpose will be to manage these supply chains, and hence, partnerships of this nature are necessary.

The manufacturing company will need to create a partnership with a database or an analysis company for marketing purposes. In 2035, data will be as valuable as money, and companies with higher amounts of data will be more powerful. A manufacturing company must create a partnership with these types of companies to search their potential market, and for advertisement strategies.

A good company needs to take care of their employees at all time, and hence they need to focus on the below points to keep their employees happy and competitive,

1) The necessity of critical thinking skills

In 2035, the manufacturing companies will observe new problems which will be unprecedented. The solution to those problems will not be textbook-based, and hence, more companies will require people with critical thinking and problem-solving skills. Therefore, the companies should start recruiting people with more qualifications having a highly critical thinking environment.

2) Ease of learning

The manufacturing company will have to bring in new technological devices which will be very different from the current ones, and so the company will have to implement methods in which the employees can work with the new technological advances with ease. For achieving this the company will have to create a learning center or an application, where the employees are trained on a regular basis for getting comfortable with the new advancement they are faced with. A small incentive could be given to the employees who perform well in these courses. In this way, the employees of the company will always be productive.

3) Use of Digital twins and digital threads

With the advent of AI, ML, and computer technology, the conventional employees of the manufacturing company will find it difficult to understand the new technologies of their field. In

this case, Digital Twins and Digital Threads come to aid as they help employees visualize new technology. This visualization not only makes it easy for the employees to learn new technology but also motivates them to adopt it.

4) Need for cybersecurity

The number of companies investing in intellectual property is increasing, and slowly they are slowly including research hubs. As there is an increase in confidential research being done in such companies there must be cybersecurity software and protocols to safeguard their intellectual property. The company should design a code of conduct under which the full credit of the research is given to the researcher or the company which will only give an advantage to them.

In conclusion, the overall company needs to be adaptive, and focus its energy on being innovative. Uniqueness in the market will become a defining factor in the future. The manufacturing company must emphasize a positive and cohesive work environment by encouraging their employees through support and training. The company needs to stay up-to-date with the current technology in the market, and also predict strategies that can give them a competitive edge.

To illustrate the efficacy of the points stated above, we will apply them to a car manufacturing company in the year 2035. This car manufacturing company is converting its production line from IC engines to electric cars. This company is also focused on building self-driving cars and inculcating the most advanced technology.

The company will need to have the following technology to have an upper edge in 2035:

1) AI to customize design

In 2035, AI will be able to design car models and recommend special features. AI will use the database which is available on the internet to make decisions about the design and manufacturing process. The company must invest in data-driven tools, AI systems, and AI engineers to create designs. AI will also help to create robust designs, which will be more accurate and have very few uncertainties. Additionally, by using these tools designers will be able to design premium cars at a relatively low cost.

2) Adapting the industrial revolution 5.0

In 2035, most big companies will start advancing towards Industry 5.0. The car manufacturing company will have to adapt to industry 5.0 and By doing so, the company will be able to manufacture car designs which could be quite impossible for an employee to do. Additionally, as the AI machines will be working independently, the cars could be manufactured at a much faster rate. The car manufacturing company also needs to pay attention to the well-being of employees, and they should implement activities wherein the employees can control the AI system.

3) Recruiting researchers and developmental engineers

The car manufacturing company needs to recruit people who are thriving in the research field, and creating knowledge because in 2035 the companies will be more focused on knowledge creation. To always have an upper edge in the automobile sector, the company needs to have researchers who can constantly suggest new ideas.

4) Include multiple features

With the advancement in technology, the cars which will be available in 2035 will not only be good automobile engines but also cater to the comfort and ease of the customer. The cars must be the self-driving car, with AI features. It should be working on electricity in order to attain sustainable development. Additionally, there must be features that the customer desires. For example, if a customer wants a coffee machine, the company should be able to provide it in the car. The company should focus on making customizable cars.

5) Manufacture more in less workspace

It is estimated that by 2035 the world's population will increase drastically. So essentially, more cars will be in demand. Hence, the company needs to manufacture cars at a faster rate, and at a smaller workspace. This could be possible by using flexible manufacturing techniques, and robot-driven manufacturing techniques. By using these technologies, custom-made cars will be made at a faster rate.

6) Additive and modern manufacturing techniques

If a company desires to be a global manufacturing company in 2035, it will have to comply with international as well as national laws. Now, most of the countries, are making norms for saving the environment and reduce pollution. Hence, the company needs to adapt to manufacturing techniques that will be eco-friendly and not contribute to pollution. Additive manufacturing can be a stepping stone for this because it not only saves material but also creates products that are recyclable. Additionally, the company needs to research in the fields of alternative sources of power such as solar power or increase the life of batteries by making them rechargeable.

7) Robust management system

In 2035, the market will be unpredictable and extremely susceptible to change, and so the management needs to think robustly. There could be a possibility that the employees find it difficult to work with such advanced technology, and hence, in that case, the management needs to educate their employees in order to ease any workplace disparities that may arise. Additionally, the currency may shift to cryptocurrency, hence the company should make diverse investments.

8) Decentralization and Centralization of various departments

In the year 2035, this automobile company will have to manufacture various parts which would belong to various engineering sections. There must be decentralization of power, and people, so that the different technology teams can perform at their highest efficiency. But, after

decentralization, it is also important that the different teams coordinate with each other to achieve a single goal. To do that, the company needs systems engineers to manage all the departments.

9) Use of IoT and shared intelligence

The company needs to have designers are manufacturing machines connected with each other. The company will have designers in one place, and the car manufacturing equipment in some other. At this time IoT will help the automobile manufacturing company to work together. IoT will also help in sharing of information and intelligence between experts and machines which will be present in various parts of the world.

Along with implementing the above-stated technology and resources, the company will have to form several important partnerships in order to ensure continuous growth and longevity in the market. It will be difficult to thrive in the market alone. Forming partnerships with rival companies in the same field of manufacturing cars could lead to easing competition as instead of fighting for the upper hand, the merged company will be able to blend its design and innovations and use that to stay at the top of its game. The company must keep its eye out on emerging competitions in the automobile industry that could go on to replace them. It is essential to know what the overall automobile market consists of. Another important type of partnership to be formed is with companies that deal specifically with AI and cybersecurity. They will be able to contribute significantly to the technological advancement of the company such as software for self-driving, tacking and navigation, automatic parking, communication system, and so on. Along with this, companies should look into universities that have students who research in automobiles, machine learning, and alternate energy resources and provide them with internships in exchange for information and knowledge. Needless to say, it will save a lot of time and monetary expenses if the company decides to outsource their standard parts requirement to other companies or even bring them under the organization's umbrella. A car manufacturing company can easily partner with standard tool manufacturing suppliers, software companies, material producing companies, and so forth.

Conclusion

As opposed to the current situation, the world will see a new generation of industry in 2035. The manufacturing company and its employees need to understand the potential of AI, Industry 5.0, and other technological and management advancements in order to be competitive globally. The number of technical, research challenges and strategies will increase and new technologies will come into play at a much more frequent rate. The employees of the company need to acknowledge the significance of a continuous learning curve and companies will need to create a cohesive atmosphere in which employees and machines work in synergy to achieve their highest efficiency. The company will also have to transform from working as a single unit to adapting a decentralized system. The forms of the partnership will also have a stark contrast as compared to how it is today, where instead of ruthlessly competing with each other, the companies will have to work in

harmony to sustain themselves in the market. The company will have to adopt new technologies like additive manufacturing, flexible manufacturing, IoT, Digital Twins, and Digital Threads at a much larger scale. We need to remember that although menial jobs may reduce, a new job market with much larger potential will be created. Hence, manufacturing companies need to implement new policies continuously to maintain their workforce and position in the global market.