Current Global Reviewer

UGC Approved International Research Refered Journal For All Subjects & All Languages

ISSN 2319-8648 | Impact Factor - 2.143 | Indexed (IIJIF) | UGC Approved Sr. No. 64310

SPECIAL ISSUE

Date: 19th & 20th January 2018

Volume I, Issue-I

Gokhale Education Society's

Shri Bhausaheb Vartak Art's Commerce and Science College, Borivali (W), Mumbai-91

(NAAC: B+ & ISO Certified)

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INTERNATIONAL CONFERENCE

ON

IMPLICATIONS OF RECENT ECONOMIC REFORMS ON INDIA IN CHANGING GLOBAL SCENARIO

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CURRENT GLOBAL REVIEWER
Special Issue
Issue I Vol. I , 19th & 20th Jan. 2018
UGC Approved
Sr. No. 64310
ISSN : 2319 - 8648
Impact Factor : 2.143

7) An Assessment of Six Dimensional Model for the Industry 4.0

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Introduction:

Industry 4.0 started in Germany. The momentum is gradually picking up in the United States, Japan, China, the Nordic countries and the United Kingdom to bring this into the system. Companies all over the world are expecting to dramatically increase digitization over the next five years. By 2020, the US aims to achieve 74 percent digitization from the current levels of 32 percent, Asia Pacific to 67 percent from current 36 percent and the Europe, the Middle East and the Africa to 71 percent from current 30 percent. Industry 4.0 is all about optimization of smart, flexible supply chains, factories and distribution models where machines capture and convey more data via machine-to-machine communications and to human operators. All this aims at enabling businesses to make quicker, smarter decisions, all while minimizing costs. Industry 4.0 is an initiative started by the German Government in 2006. The initiative's intention is to digitize the manufacturing sector in order to increase productivity. The German industry is expected to invest a total of €40 bn in Industry 4.0 by 2020.

According to IBEF, the Government of India has set an ambitious target of increasing the contribution of manufacturing output to 25 percent of Gross Domestic Product (GDP) by 2025, from 16 percent currently. IoT, being one of the most important aspects of Industry 4.0 for India,
is expected to capture close to 20 percent share in global IoT market in the next five years. According to IBEF forecast, the IoT market in India is projected to grow at a CAGR of more than 28 percent during 2015-2020. Government of India has taken initiatives such as Green Corridors and 'Make in India'

The Indian automotive sector is witnessing a boost and thrust from the Government of India which emphasizes and focuses on introduction of new and revolutionary production processes into the Indian manufacturing system by keeping ICT at the heart of development. India is expected to become a major automobile manufacturing hub and the third largest market for automobiles in the world contributing approximately 25 percent of the GDP. With this vision, the massive expansion in the Indian automobile industry makes the country ready for the era of "Industrial Revolution 4.0".

The present paper makes an attempt to probe the assessment of six dimensional model for the Industry 4.0.This can be focused with the help of the following headings:

Objective of the Study:

The present paper highlights the origin of the assessment of six dimensional model for the Industry 4.0.

Methodology:

The data for the present study has been collected from existing secondary literature, such as books, journals, published and unpublished annual reports, Govt. Manuals/Orders, websites etc.

Conceptual Framework:

Industrialization started with steam and the first machines that mechanised some of the work that our ancestors did. Subsequently we had electricity, the assembly lines and the birth of mass production and then the third era of industry came in with the advent of computers and the beginning of automation when robots and machines began replacing workforce on those assembly lines. Now we are expected to enter a new world of Industry 4.0, in which computers and automation will come together in an altogether a new way, with robotics connected remotely to computer systems equipped with machine learning algorithms that can control the robotics with minimum human support.

"Industry 4.0 has highly intelligent connected systems that create a fully digital value chain. It particularly is based on cyber physical production systems that integrate communications, IT, data and physical elements and wherein these systems transform the traditional plants into smart factories. Here the objective is that the machines talk to other machines and products and information is processed and distributed in real time resulting in profound changes to the entire industrial ecosystem".

Assessment of Six Dimensional Model for the Industry 4.0:

It is necessary to assess the Industry 4.0 readiness of industrial enterprises as manufacturing sector is currently facing substantial challenges. These challenges are in regard to disruptive concepts such as the IoT, cyber physical systems or cloud-based manufacturing. Subsequently,

Increasing complexity on all firm levels creates uncertainty about respective organizational and technological capabilities and adequate strategies to develop them. A Foundation for mechanical engineering, plant engineering, and information technology of German Engineering Federation (Mechanical Engineering Industry Association -Verband Deutscher Maschinen- und Anlagenbau has its headquarters in Frankfurtam Main, Germany-VDMA) has coined a six dimensional model to assess the readiness of the enterprises, wherein VDMA experts and some industry representatives served in an advisory capacity in the development of the study. The potential, especially for Germany's mechanical engineering industry and plant engineering sector, is indeed great, both for providers and for users of technologies across the spectrum of Industry 4.0. But there are still many unresolved questions, uncertainties, and challenges. The readiness study seeks to address this need and offer insight. It also highlights the challenging milestones that many companies must still pass on the road to Industry 4.0 readiness.

Business objectives:

Operational excellence:

- Enhanced efficiency through greater automation
- Customized products at the cost of a mass produced product

Expanded Services:

- Higher revenues from digitally refined products
- Access to new markets

Six Dimensional Model:

As per the current understanding of Industry 4.0 the readiness of the enterprises can be assessed on the below mentioned six dimensions:

1. **Strategy and organization:**

2. Smart factory
3. Smart operations
4. Smart products
5. Data-driven services
6. Employees

A key point in this understanding is that the first two dimensions (smart factory and smart products) relate to the physical world, while the other two dimensions (smart operations and data driven services) represent the virtual representation of physical dimensions. According to this concept, Industry 4.0 can be called as the fusion of the physical and virtual worlds. The six components of readiness model are elaborated below:

1. Strategy and organization:

Industry 4.0 offers a new opportunity for developing altogether new business models apart from improving the current processes through the use of digital technologies. The current openness and the cultural interaction can be examined using the following criteria –

- Existing knowledge strategy implementation of Industry 4.0
- Review strategies through a system of indicators for better operation
- Measure the enterprise Investments relating to Industry 4.0
- Understand the use of technology and innovation management
- Understand the current state of research and development

2. Smart factory:

The smart factory is a production environment in which the production systems and logistics systems primarily organize themselves without human interventions. It relies on cyber Physical systems (CPS) which links the physical and virtual worlds by communicating through an IT infrastructure/IoT. A company's progress in the area of the smart factory can be measured using the following four criteria:

- Digital modeling
- Equipment/component infrastructure
- Data usage
- IT systems/infrastructure

3. Smart operations:

The technical requirements in production and its planning which are necessary to realize the self-controlling work piece are known as smart operations. Industry 4.0 readiness for smart operations can be determined by the following –

- Information sharing
- Cloud usage
- IT security
- Autonomous processes

4. Smart product:

Smart products are the foundation for the 'smart factory' and 'smart operations' and are critical components of a unified 'smart factory' facilitating automated, flexible and efficient production. Physical components are equipped

ith technical components such as sensors, RFID, communication interface etc. to collect data on their environment nd their own status. Readiness in the area of smart products shall be determined by looking at the ICT add-on unctionalities of products and the extent to which data from the usage phase is analyzed.

. Data driven services:

A company evolving from selling products to providing solutions substantiates data driven services which are used to lign future business models to enhance the benefit to customers. The after sales services business is based on the valuation and analysis of collected data and reliance

on enterprise wide integration. The physical products themselves must be equipped with physical IT so they can send, receive, or process the information needed for the operational processes. Readiness in this area can be determined using the following three criteria:

- Availability of these services
- Share of revenue derived
- Share of data used

6. Employees:

Employees help companies realize their digital transformation. And readiness in this dimension can be determined by analyzing employee's current skills and the ability to acquire new skills as employees are most affected by the changes in technology in an organization; directly impacting their work environment. This requires them to acquire new skills to get well equipped with the digital workplace. Thus, the above model will help to assess the company's readiness on various critical parameters and analyze the potential gaps which need to be addressed in order to adopt Industry 4.0.

Today, in an Industry 4.0 factory, machines are connected as a collaborative community. Such evolution requires the utilization of advance prediction tools, so that data can be systematically processed into information to explain uncertainties, and thereby make more "informed" decisions.

Conclusion:

Industry 4.0 is expected to be a huge boon to companies that fully understand what it means for them. Change of this nature will transcend company's boundaries where they operate. This segment gave us an insight on the global approach towards Industry 4.0, the readiness, the initiatives taken by various countries & major automobile giants and the innovations & developments impacting the automotive sector. The focus in the forthcoming segment will be laid on the importance of the fourth industrial revolution on the Indian economy, the major steps taken by the OEMs, government and the customers to adapt the new trend and recent technological developments.

India has a number of programs to enable innovation and ensure the talent pipeline for manufacturing. Some are well established, and others are quite new and very innovative. It is clear that Industry 4.0 presents tremendous opportunities, and this fact highlights the need for a highly trained and flexible workforce and production capacity that can answer the needs of tomorrow as well as those of today.

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Indexed (IIJIF)

ISSN 2319-8648

Impact Factor- 2.143

UGC Approved
Sr. No. 64310

ISSN 2319-8648

Chief Editor
Arun B. Godam
Latur, Dist. Latur-413512
(Maharashtra, India)
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