

ANALYSIS OF NEW BUSINESS MODELS IN INDUSTRY LEVERAGING INDUSTRY 4.0 FOR VALUE CREATION

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Introduction

The evolution of technology and its accessibility has increased significantly over few years. Latest to the technological revolution is Industry 4.0 and industries are realizing value creation out of it. Organizations are empowered with cutting edge technologies like utilizing power of data, automation, artificial intelligence, IOT, 3D printing etc. Businesses are opening opportunities to create value and make best use of it becoming innovative and developing new operational methods using Industry 4.0. it is no more a vague term for companies, SMEs are understanding the necessity for it and exploring possibilities of adoption. In the paper 'Business Models in the Industry 4.0 Environment—Results of Web of Science Bibliometric Analysis' [1] by Sandra Grabowska 1, and Sebastian Saniuk has mentioned that the business model can also be understood as the organizations adoption of method of increasing and using its resources in order to provide customer needs ahead of competition at the same time ensuring organizations profitability. Organizations are moving towards disrupting exiting models of operation and going agile to respond for abrupt market changes and customer needs. Next session will detail about different business models, its impacts and future. The report will be concluded with realization of new business models for value creation and operating methods for sustainable growth for companies especially SMEs.

Analysis

According to [1], the business model is more like business management as it is related to business processes. It is about how the business is intending to conduct the business using its resources, products/services in its environment delivering customer satisfaction and growing through profits. The Paper conducted a study on existing research and papers published in business models and Industry 4.0 and the results are given below.

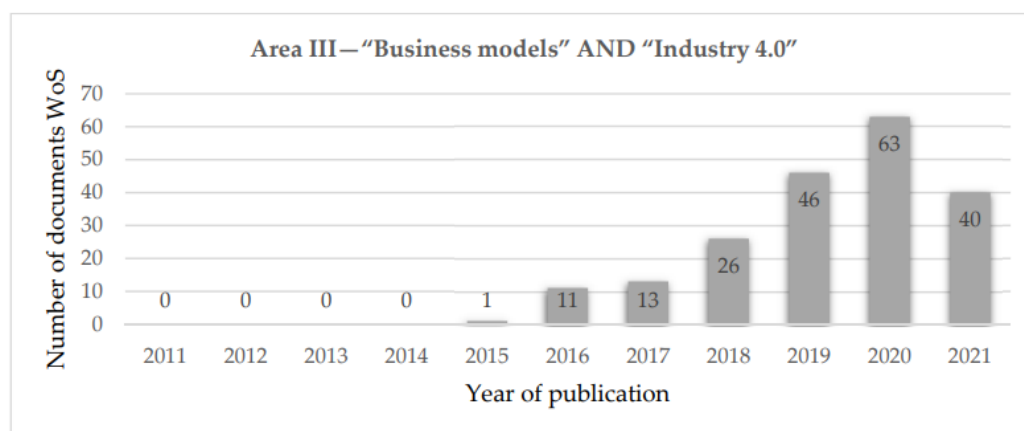


Figure1: Number of published documents on the theme over the years [1]

The graph shows comparatively lesser research in the area and a research gap concerning the details of methodology of building these models. The major areas to look at would be how SMEs can develop these business models leveraging Industry 4.0 and make a sustainable growth and keep a positive social dimension. Key areas related to business model and Industry 4.0 are clustered as below.

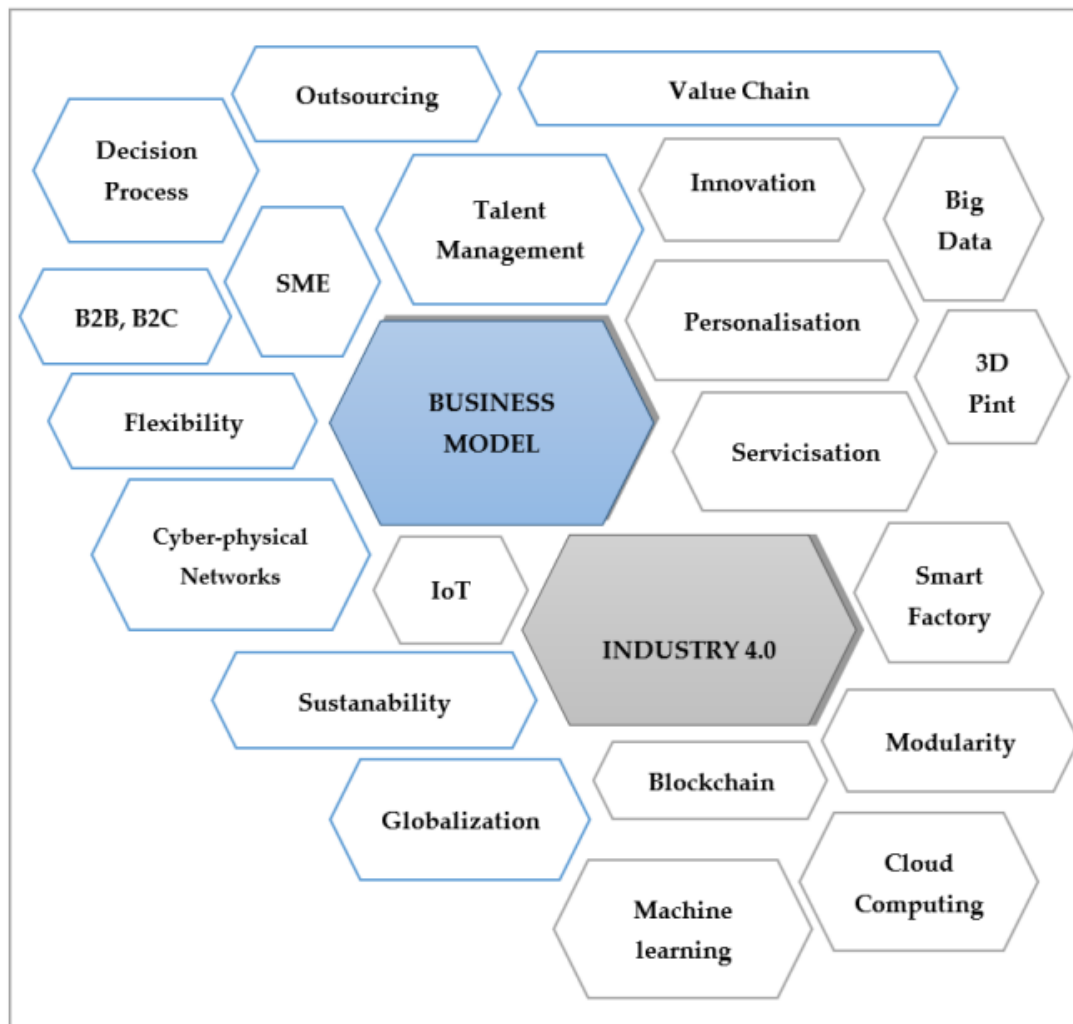


Figure2: Pillar cluster of business models of enterprises [1]

An open business models which allows introduction of open innovations, rapid reorganization of processes and very flexible adjustment of the functioning of companies to new conditions and dynamically changing competitive and common environments [1] would be ideal in the Industry 4.0 era. This will open new doors to collaboration, sharing of knowledge and innovation and uplift of entire industry making profit and supporting circular economy.

The industry 4.0 technologies like utilizing power of data and data analytics will help businesses to make data-oriented decision making rather than traditional planned decision making. For example, smart sensors can be implemented on shopfloor to condition monitor the machine's health and data analytics can be implemented to detect abnormal behaviour and predict machine failures well in advance to avoid any costly damages. This kind of predictive maintenance will allow organizations make significant savings in maintenance cost as well as plan the logistics to minimize the downtime and improve operational KPIs like machine availability, reliability etc. Similarly, customer behaviour

data can be utilized to tailor innovation in the demanded direction and face competition. Smart supply chain would allow tracing of the product from its raw material stage to customer hands.

IOT is a common term in any industry now. Connected devices and machines work together to deliver optimal performances and digital twins can be utilized to simulate machine behaviours, implement control strategies to accommodate the changes and detect any deviations in operations to plan and act appropriately.

3D printing/additive manufacturing is another Industry 4.0 widely used in manufacturing industry which will allow prototyping of complex parts involving short lead time and minimal waste compared to subtractive manufacturing. This will allow to test new designs to market for its intended functionalities and changes can be made before mass production.

DES (Discrete Event Simulation) is another technology which is massively used in industry to optimize manufacturing operations making best use of space and resources. Different trial and customization can be done before actual process implementation to ensure operating within best possible spectrum. If a company want to introduce a new facility and want to design the manufacturing process and its operation, DES is ideal solution to carry out simulation and customise to meet process KPIS like lead time, optimised use of resources etc.

Artificial intelligence applications have become common in industries from small to large implementing solution like visual inspection to complex AR-VR utilization. Many companies have low-cost solutions for visual inspection of defects in products which would avoid defective product going to end customer. Earlier manual inspection was done it was error prone as well as tedious not value add for the employee. With the added advantage of more productivity and quality, visual inspection system is definitively needed for any industry where applicable. By this way, human resources can be reallocated to more value-add processes. AR-VR technologies can be used for assembly lines, automate work instruction and train employees in virtual world to improve the effectiveness. Standard procedure with AR-VR interventions can improve the quality of processes, reduce errors, improve productivity and employee satisfaction.

There are other technologies as well which will improve the operation parameters for the organization by implementing Industry 4.0 technologies. According to [\[2\]](#) As a result of this new embedded usage of digital technologies, companies can achieve success in terms of experiencing optimized resource utilization, reduced costs, increased employee productivity and work efficiency, optimized supply chains, increased customer loyalty and satisfaction. Companies are under pressure to put digitalization under their strategy and in their business operating model but are less knowledged on how to reflect in their business operation as it is an emerging methodology. The physical and digital world should go hand in hand to realize digitalization of manufacturing industry. (e.g., Industry 4.0) (Linz et al., 2017). Digitization is conversion of analog to digital data and digitalization is its impact on organization's BM (business models)

A recent business model developed is providing anything as-a-service. From software to products, subscription-based models are enabled transforming how products are delivered to customer. This makes customer access systems on need basis rather than one time purchase without analysing future opportunities and customization based on the changes in demand and pay for only usage. For the company this has multiple benefits. One is generating predictable and recurring revenue streams while the other is remaining competitive and innovative to retain the subscription. Creating new data sources through installation of smart sensors of software systems, automation, transparent supply chain and digital customer interface are the foundations for new BM.

A recent site visit to a bottling company in Wales revealed that even though they have wide portfolio, major operations and value capture is manual. Possibilities of data capture through advanced systems and interconnected systems with transparent supply chain would make them more productive, sustainable, and aligning to new environmental needs and legal terms. Interconnected systems are required to gain more visibility of existing operation, channelizing resources to needed places and utilize the machine to their best usage.

Hence the new BM should be an intensive process considering all aspects of business operation at the same time agile to be more flexible to changes. [2] says, to increase the success of the designed BM on the market, the company must have a good understanding of customer requirements, value chain to give customer what they want with cost benefits and should have neutral perspective on outsourcing (Teece, 2018) [4]. The ability of BM to react to abrupt changes makes it versatile and that is its dynamic capability (Dottore, 2009) [5]. It is the learning-driven approach of sensing, seizing and reconfiguring in particular, which provides the business with opportunity to adapt and meet changing requirements in alignment with the business strategy (Mezger, 2014; Teece, 2018) [3], [5].

The new business model involving Industry 4.0 technologies should be supported by its resources. That is culture change and solving the skills gap should be part of new business model. One of the major challenges for SME to adopt Industry 4.0 is lack of skills of its resources to take forward the innovation and utilize the benefits of existing system. Many of the site visits have revealed that companies are not utilizing existing MES (manufacturing execution system) or ERP systems to its capabilities because of lack of skills or resources. It is used to its primitive stage just for basic management, not definitely to data capture or utilization of the data. So proper training and sustaining cultural changes are adequate with new business models of operation otherwise, the strategic growth will be hampered. The need for change should be understood from shopfloor to top floor and top management would facilitate smooth transition to digital transformation utilizing Industry 4.0

In the same paper [2], different levels of business operation were detailed as below.

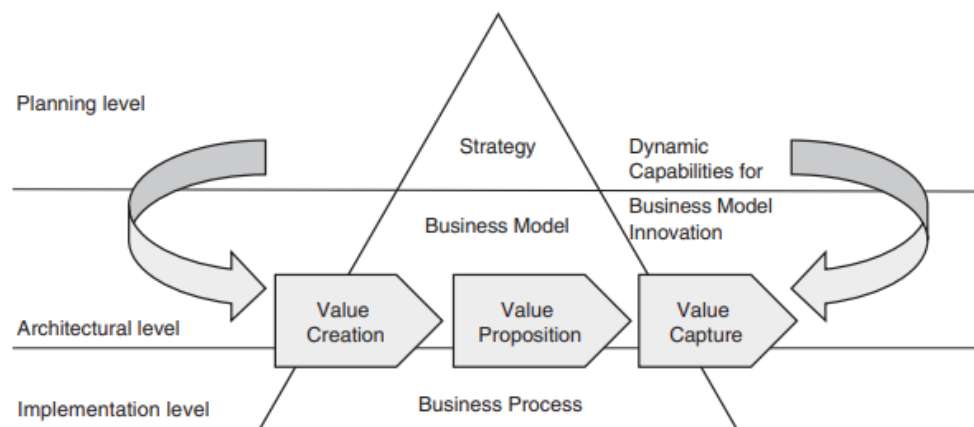


Figure3: Business operation levels [2]

Conclusion

The business models of organizations are at a transformative stage where new method of operations is needed to accommodate the digitalization and digital transformation that are brought by Industry 4.0 technologies. Companies are realizing the values and adopting digital transformation stage by

stage making small investment and scaling up to improve operational KPIs and reduce waste and cost. Companies are becoming ambitious to penetrate the customer market and face competition by customizing their products to match the demands. Digitalization is revolutionizing the BM and in turn driving new methodologies of operation for create value out of new and emerging technologies. The opportunities, benefits and challenges were discussed when new BM are adopted to leverage the Industry 4.0. The BM are transformative by itself and transforming the industries as well deriving new paradigms of operation generating value and sustainable future.

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