

Advanced Industry 4.0 (ACPA7000)

Assignment 1

Identify new business models and forms of operations leading to new sources of value that could be enabled with new and emerging Industry 4.0 Technologies

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Abstract.

This research will initially define the possible progression of new business models and value creation, as take-up of Industry 4.0 technologies increase. It will then look at some examples of business model evolution and value creation across a wide range of industries.

Introduction, Aims & Objectives

The advances of Industry 4.0 technologies in the areas of industrial production and communication technologies have seen the manufacturing world increasingly adopting these methods in their operations. The physical and virtual worlds are converging to form new cyber-physical systems (CPS) which are bringing increasing change to manufacturing.

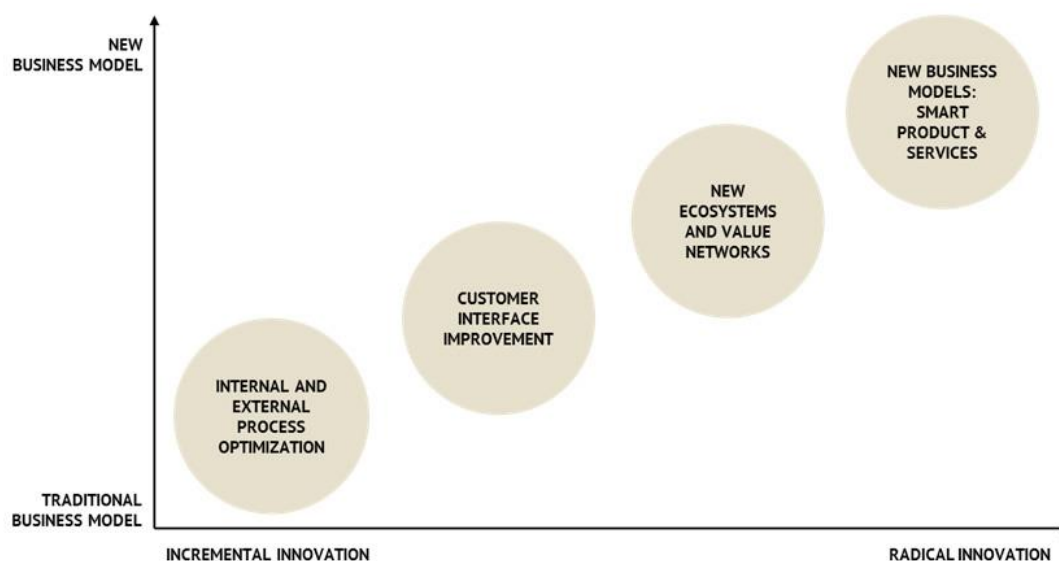
The generation of new business models and value must be essential focus for manufacturing businesses preparing for the future. As Klaus Schwab states in “The Fourth Industrial Revolution” (Ref 1) the pathway to the future is now defined by the ‘Internet of things’ – the collective of physical objects, sensed machines, data exchange, and programs that are part and parcel of that journey.

In a recent US manufacturers survey, some 36% felt well-prepared for next 10 years. Only 55% of manufacturers felt ‘adequately’ prepared, whilst 9% felt completely unprepared, which would place them in serious jeopardy of not surviving them as a business. The complete adoption of Industry 4.0 technology contributes to moving business forward to a more certain future. (Ref: 2)

The aims of this research will be to identify some business models and forms of operations that are emerging, and what objectives are already being sought and attained by these models in generating real value for stakeholders.

Outlining the progression of new business models and value creation.

The range of new business models that may arise from Industry 4.0 can be studied from the perspective of the level of innovation that generates them – a very useful classification of these levels of innovation was used by Ibarra (Ref: 3), derived from Osterwalder and Pigneur (Ref: 4) illustrating the new Business Model Definition, shown below.



Conducting digital transformation in industry, models against innovation level. (Ref:4)

This progression can be demonstrated by showing how the increasing levels of innovation drive consequent increase in novel value from the resulting business model. Examples of each level of incremental innovation and model generation can be demonstrated as follows:

Internal and External process optimisation – the first step for manufacturing companies without addressing high risks, and would include technologies such as big data, cloud computing, collaborative robots, additive manufacturing, or augmented reality. This leads to value creation by product and resources traceability, machine to machine connections, better employee training and flexibility, and better management transparency. The value delivered would be higher flexibility in production, better customisations, and greatly improved efficiency. This would be measured in cost optimisation and better use of resources.

Customer Interface Improvement – this is an innovation increment focused on value delivery, the customers product and service offering, new customer segments, channels, and better customer relationships. These can all be further improved with introductions of big data, cloud computing, augmented reality, and virtual reality to increase touchpoints and understanding of customer's needs. The value captured here would include cost savings and new revenue streams based on dynamic pricing, pay-per-use, and online payment.

New ecosystems and value networks – with more radical shift in the business model, the core business can be more closely linked with the companies associates, supply chain and other stakeholders, developing skillsets needed to communicate at all levels, and linking the value creation process with the stakeholders' processes. Real time information sharing can improve value in stock and raw material inventory, personnel availability, etc. This moves from value chains to an ecosystem should develop better value for all stakeholders and cost reductions possible, new customer segments and a broader product offering.

Radical new business models - Smart products and services – the level of innovation should increase to a radical level, driven by increasing confidence on the possible outcomes from the prior incremental steps. The advance into embedded systems and intelligent sensing will offer new and improved goods and services such as remote installation or activation of product upgrades. The generation of value results from direct relationships between customer and business, allowing customers to be co-creators and developers of the product offering.

Sector examples of model evolution and value creation.

An excellent example of emerging connected technology is additive manufacturing (AM), which has developed now to be a strong tool in manufacturing product development systems. Early examples were personally witnessed at the Penske Racing Team facility in Bournemouth as early as 1990, producing complex fuel manifold prototypes which conventional manufacturing could not replicate – the value here was incalculable in both monetary terms, and in training technical staff.

The relative portability of AM technology allows simpler and faster prototyping, very likely using a single AM machine with a range of tools and controls. The connectivity allows transmission of datasets to allow remote production and easy updates to design - healthcare items in remote developing countries being a current example. This is a business model unthinkable to the small companies involved prior to this connected technology.

The properties of the fabricated AM material, density, reliability, and the recognition of body and surface quality properties is a new material science, and this will lead to new business models to those

who inspect and assure technical performance. AM demonstrates a step-change in the manufacturing arena, previously plagued by heavy reliance on supply chains, access to machining time and tooling for prototypes, and the usage of fasteners or joining processes to build parts into finished items.

The use of SCADA systems in process industry control has been established for many years, viewing and control being through a simple HMI screen. A logical extension of this is enabled by using Industry 4.0 connectivity to monitor the machine condition. There is the ability to predict faults and low performance, adjust, and place an intervention in motion from a great distance. At Turboden, remote monitoring of condition, efficiency, power production and fault levels of turbine machinery is now offered to clients routinely. This allows management of the plant and integrates with the onsite SCADA to work alongside the local staff (Ref 5).

Industry 4.0 connectivity and intelligent sensor equipment now allows remote data acquisition from utility and process equipment in any business premises. This data can link to optimisation software, such as GridDuck or Grid Imp. The equipment allows recognition of power usage, wastage, mechanical and electrical condition, remote adjustment, optimisation, and fault finding. A further new business model would be 'mining' customers' energy data as an ongoing benefit customer and to allow connectivity of their energy sources, including self-generation, and the extension into 'private-wire' supply systems. (Ref 6)

The extension of this asset connectivity allows information to be known and tracked, opening new models for sales and value. Customers may not buy but pay according to usage. Current examples would be public access Ebikes, or the automatic supply of consumables for assets. (Ref 7).

The automobile industry is embracing the digital transformation. There is rapid change in the business models and opportunities for value are considerable in production, but also including development of EV charging collectives and new EPOS services. There is also the move to formalise car sharing and advanced telematics, which facilitates direct communication for rescue, theft protection, asset tracking and recovery (Ref 8).

The full identification of the 'hidden factory' waste (Ref 9) will become a reality with increased data availability and processing possible with Industry 4.0. Companies such as Pathfindr are creating value by locating, analysing, and reporting on wastage data on the user's software platform, and what it means for operations. This already includes tracking raw steel through its processing, or bulk oil as it crosses the globe. (Ref 10)

For the societal and skills aspects of business, the competence required for continuous adaptation of the production system, is the critical success factor of manufacturing. Workers able to make the transition to Industry 4.0 may find greater autonomy and more interesting work - employers need personnel with creativity and decision-making skills as well as technical expertise. (Ref 11)

Conclusion:

The identification of new business models and sources of value from Industry 4.0 technology has been demonstrated in a logical pathway for business to follow, followed by some current industry and commercial examples of manufacturing aided by and progressing with, Industry 4.0.

A common thread with the examples is that companies need to understand they are changing into data companies. The value of the data they hold for legacy manufacturing, as well as the accumulation of current data, will become one of the businesses most valuable assets.

Additionally, very existence of companies will increasingly depend upon the security of their devices and assets. Industry 4.0 must come with commensurate security necessary to maintain the confidentiality essential to business' survival.

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