

## Implementing Industry 4.0 Concepts to a Media Content Supply Chain and a Food Processing Business: Case Studies from Finland

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Received: May 7, 2022 / Revised: July 23, 2022 / Accepted: September 15, 2022

### Abstract

Industry 4.0 is an ongoing revolution and is affecting profoundly in the media industry and is changing the manufacturing sector. The research elucidates a clear understanding of the Fourth Technology Revolution, Industry 4.0. The study focusses critically on the benefits and possibilities that Industry 4.0 technologies bring to operational supply chain and customer outcomes. Two case studies from Finland viz, Sanoma Media Finland's (Sanoma) content supply chain and a Southern Finland located meat product manufacturer (hereafter referred as Company X is a food processing business) have been studied. Sanoma Media Finland is the leading multi-channel media house in Finland and Company X is a Helsinki-based food processing SME specialising in producing and delivering raw doner kebab. The authors have tried to research the concept of the Fourth Industrial Revolution by conducting a literature review, and to create a scenario where those concepts are implemented to the supply chain in the two case companies. Findings from the Sanoma Media Finland case illustrates that using Industry 4.0 technologies, media companies can take advantage of knowing the consuming habits of the audience. Using available data for building automated content supply chain would decrease the costs and increase the accuracy of content popularity. Findings from the case of Company X, illustrates that the Industry 4.0 aspects substantially helps to push the company in the right direction. Automated manufacturing processes, data gathering from machines for remote monitoring via the IoT, and more automatic inventory and order management helps to cut costs and reduce spoilage, while simultaneously improving the quality and increasing the output. The research study concludes that implementation of Industry 4.0 ultimately leads to improved financial performance and enable companies to remain competitive. Transformation requires that every stakeholder in the supply chain commits to the new standards.

**Keywords:** Industry 4.0, Content Supply Chain, Finland, Food Processing, Scenario analysis

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## Introduction

The purpose of this research is to state a clear understanding of the so-called Fourth Technology Revolution, Industry 4.0. This research is focusing critically on the benefits and possibilities that Industry 4.0 technologies bring to operational supply chain and customer outcomes.

The authors attempt to research the concept of the Fourth Industrial Revolution by conducting a literature review, and to create a scenario where those concepts are implemented to the supply chain a chosen company. First, the company is introduced. Second, the literature review regarding the Fourth Industrial Revolution is presented. Third, a scenario is created where the concepts of the said revolution are applied to the supply chain of the company.

This research illustrates the real effect of the technological revolution in the supply chain management using Sanoma Media Finland's (Sanoma) content supply chain as a point of reference. Sanoma is the largest commercial media house in Finland and reaches almost every Finn weekly (Sanoma, 2020). Consumption of digital videos is increasing, and the competition between online video services will intensify (Wayne, 2018). Taking advantage of modern technology is necessary for media companies like Sanoma to compete the most significant online video platforms such as Netflix, Amazon and Hulu.

The authors use two cases studies to elucidate the Industry 4.0 concepts implementation viz, Sanoma Media Finland's (Sanoma) content supply chain and Company X, a food processing business in Finland.

## The Industry 4.0: Review of Literature

The first industrial revolution began in the late 1800s and was initiated by the introduction of mechanical looms, an early form of automation. This was followed by the second industrial revolution roughly at the end of the 19<sup>th</sup> century, which created the conveyor belt-based division of labour and mass production. The third industrial revolution started in the late 1960s as new digital innovations began to offer robotised solutions to manufacturers and it has lasted up to the present day (Drath & Horch, 2014; Kovács & Kot, 2016). The Fourth Industrial Revolution, or Industry 4.0, is a concept that was first coined in Germany in 2011 (Xu, Xu & Li, 2018), although similar developments were also taking place in other European countries at that time (Tjahjono *et al.*, 2017). The concept, even though being currently discussed in many contexts, still in many cases, lacks a clear definition (Hermann, Pentek and Otto, 2016; Piccarozzi, Aquilani & Gatti, 2018). Indeed, as Szozda (2017) states, Industry 4.0 is still developing in many directions and continues to remain unexplored in many respects, thanks to its still unfolding nature. Industry 4.0 is a vast domain that touches on a wide variety of fields including, but not limited to, manufacturing, data management and competitiveness (Piccarozzi, Aquilani & Gatti, 2018). Despite the difficulty of defining the boundaries and concept of Industry 4.0, its very essence can be seen in the ability of the machines, components and systems to communicate with each other, which makes self-regulated production, real-time production planning and self-optimisation possible (Pan *et al.*, 2015; Kovács & Kot, 2016; Sanders, Elangeswaran & Wulfsberg, 2016). Opportunities of Industry 4.0 are considered extensive. For example, lower transportation costs, easier mass customisation, environmental



be seen as a vision (Hermann, Pentek & Otto, 2016), or as a strategy (Johansson *et al.*, 2017) that is a child of the digital revolution (Hahn, 2019), than a singular concept. It seems certain, however, that its full implications still remain to be seen.

The modern world is familiar with digital elements when consuming products and services, for example, in mobility, housing, dining, entertainment and retail. Product manufacturers and service providers can take advantage of new technologies that Industry 4.0 brings to provide better and smarter services and products to the customers. Technologies considered to be part of the Industry 4.0 have similar feature outcomes like automation and connectivity. The connectivity between users, machines and applications is called as Internet of Things (IoT) (Davies, 2015; Szozda, 2015; Louis & Dunston, 2018).

Connectivity and automation enable companies to produce services and products in a more efficient way using digital platforms, robotics, artificial intelligence and big data which are all digitally connected, providing a highly integrated supply chain (Davies, 2015). Disruptive innovations are creating the trends and companies are looking for new solutions all the time. Full automation of the flow of materials and products in production lines creates valuable data for managing purposes (Szozda, 2015).

### **Increasing productivity in the supply chain**

Industry 4.0 creates improvements and significant enhancements in productivity and revenue growth (Piccarozzi, Aquilani & Gatti, 2018). The speed of product manufacturing will improve. For example, models are created digitally, and the data can be transferred automatically to the production robots. According to Davies' (2015) data-driven supply chains can impact the manufacturing process by accelerating the time needed to deliver orders up to 120%.

Different products can be produced in the same factories, and even small lots can be taken into production fast and effective way. This flexibility leads to innovation because prototypes can be produced quickly. Automation of the production process, monitoring of the product throughout the production chain and use of configurable robots enable continuous optimisation (Davies, 2015).

To reach productivity benefits of IoT, organisations need to invest in modern equipment, ICT and computing skills and integrations. In some cases this can even outweigh the benefits of improved performance (Louis and Dunston, 2018).

### **Full visibility into the supply chain**

The connected environment in the production supply chain enables companies to analyse information in real-time (Szozda, 2015). This information is valuable for streamlining the production processes and the whole supply chain. Transparency will increase the effectiveness by enhancing the collaboration between suppliers, manufactures and customers (Tjahjono *et al.*, 2017). Customers will be able to track their orders, check availability, and even be part of the design process (Davies, 2015). This kind of flexibility may give the company a competitive advantage in its market; for example, Nike has an e-commerce service where customers can design their running shoes and order them straight to the home door.



department, Nelonen Media, operates four national television (TV) channels and Video-on-demand service Ruutu. Majority of commercial broadcasters' profit comes from tv, radio and online advertisement. Even if we tend to think that media companies produce content for audience, the gained attention is actually the product which is sold to the customer. Advertiser is the customer, not the audience.

The knowledge about Sanoma and its processes is based on meetings and interviews with Sanoma's technology and commercial leadership within the last three years.

### **Industry 4.0 in the media industry**

Industry 4.0 is affecting profoundly in the media industry because today almost every company can be a media company. Free online video platforms, such as Youtube, Facebook, TikTok and Instagram, gives companies and individuals the possibility to create their channels and start building an audience. Media companies and broadcasters are competing for the same audience.

Television advertising revenue has been decreasing, and Internet advertising will overtake broadcast television advertising (Wayne, 2018). This is why media companies need to have a clear strategy of how to stand out from this increasing flood of video content. Most TV-companies have started to focus on online services instead of traditional TV-distribution. Media companies also need to decrease their costs in the content supply chain.

### **Video-on-demand (VOD)**

Video-on-demand is an online video streaming service where the audience can choose what content they want to watch, when and where. Video-on-demand has enabled vertical integration for TV-companies to charge the audience for watching (Wayne, 2018). Subscription-based video on demand (SVOD) is based on monthly fees that the audience is paying for holding access to the content. When the customers can choose their content, their expectations are rising, and patience capabilities are falling. If the content they are watching is not pleasing, they will change the program or even the video service provider.

Competition between media companies has been changed, and there are new competitors in the markets. Digitalisation and online video services have enabled large service providers like Netflix, Hulu and Amazon to take market share from traditional TV-companies and broadcasters (Wayne, 2018). In Finnish local markets, the competition is between Ruutu, mtv.fi and Areena.

### **The content supply chain for Video-on-Demand**

Video services need to provide as accurate content as possible to audience to keep the customers committed. For example, Netflix has invested heavily in the company's movie recommendation system (Hallinan & Striphas, 2016). In this point of view, the content sourcing department is the most valuable asset in the content supply chain. Licenses for content is usually sourced through broadcast license selling companies also called as the distributors. TV-company's content sourcing department negotiates with the distributors for the

licenses to show the content in the companies' online channels. After the deal is done, the studio and the Media Management starts to discuss the media and data delivering methods. This is a time-consuming period because no industry standards for data deliveries exist.

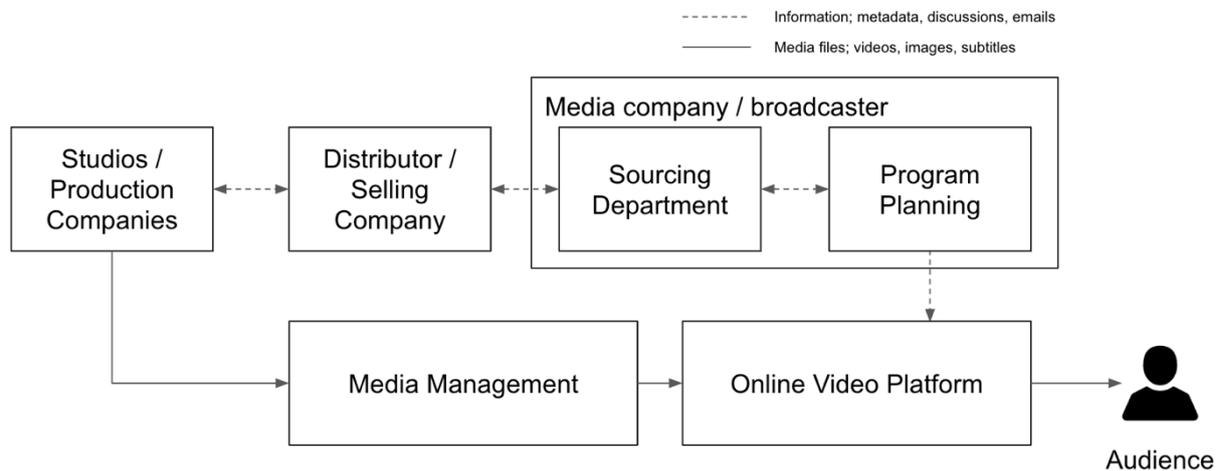


Figure 1 Media Content Supply Chain

Sourcing department needs to have extraordinary know-how on what kind of content and when the customers prefer to consume. Sourcing Department needs to have enormous databases of all available content in the world and also excellent negotiating skills and analysing tools to get good enough content at an affordable price.

Usually, content sourcing is collecting data from online video platform about customer behaviour. They have various data sources to keep up with main content trends all over the world. Data is analysed manually, and many sourcing decisions rely on the expertise of individual content professionals.

After sourcing the content, the data about the licences and publishing rights agreement will go to the Program Planning department. They need to design a schedule for publishing to maximise the views in the licensing period. In addition to estimation about upcoming program, it's target audience and it's behavioural hypothesis, the program planning department uses historical data and competitor information to schedule the publishing.

### Content sourcing platform (IoT)

Content sourcing and planning can be optimised using a centralised platform to collect all the data that affects customers behaviours and watching habits. Machine learning environment combined with historical and new data would create a hypothesis about the most valuable video content and when is the best time to do the publication. Predictions about view rates can be created even before the actual sourcing.

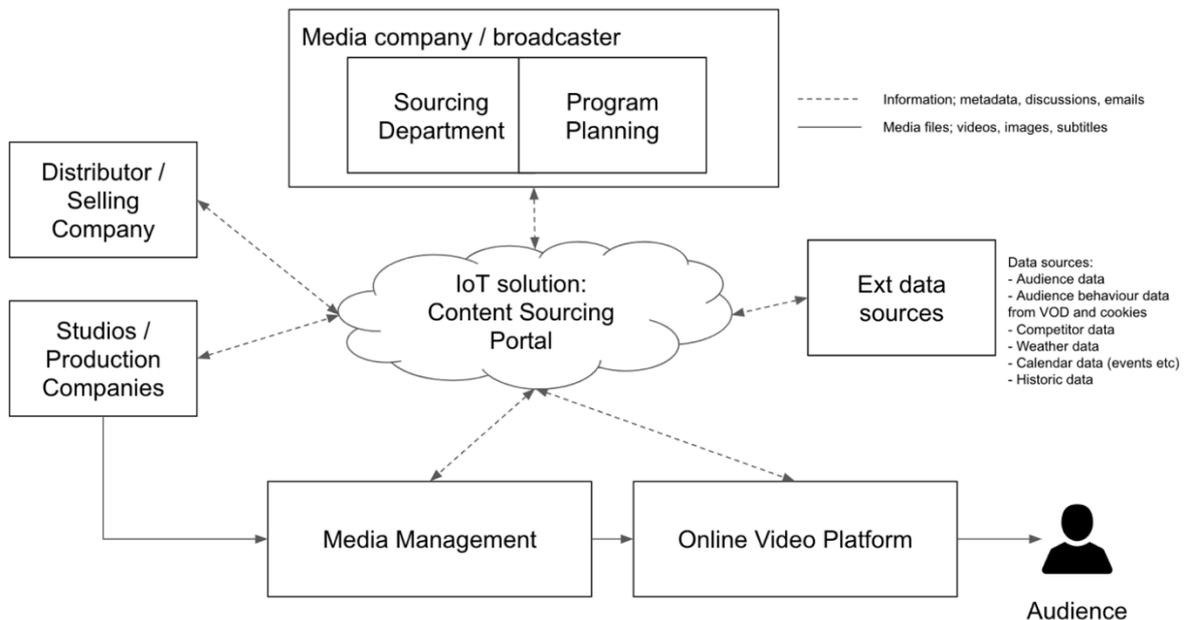


Figure 2 Media Content Supply Chain using IoT platform

Orders from the TV-company for new content could be provided automatically into the distributor's customer relation management (CRM) system and delivered to the enterprise resource planner (ERP); also, the automation of managing the actual media files would enhance more efficiency. Incoming media assets from the studios and production companies could be automatically linked to the program metadata and processing and publishing would be fully automated.

### Benefits

Operational efficiency is increased when all the metadata for program assets are handled automatically in the databases and platforms. Automation reduces manual labor and risk for human errors (Davies, 2015). Also, the sourcing and planning department could be leaned down to a few because the IoT generates accurate hypothesis and predictions. Customer experience would also increase when the content sourcing is not based only on human knowledge but then overall data targeted for each audience segment.

### Food Processing Business: The Case of Company X

The case company is a Helsinki-based food processing SME Company X. The company is specialised in producing and delivering raw doner kebab. Having a turnover of little under 8 million euros and employing seven people, Company X controls roughly 20% of the Finnish doner kebab market. The product portfolio of the company currently only contains doner kebab, and it does not produce or deliver any other products. Company X is organised as a limited liability company.





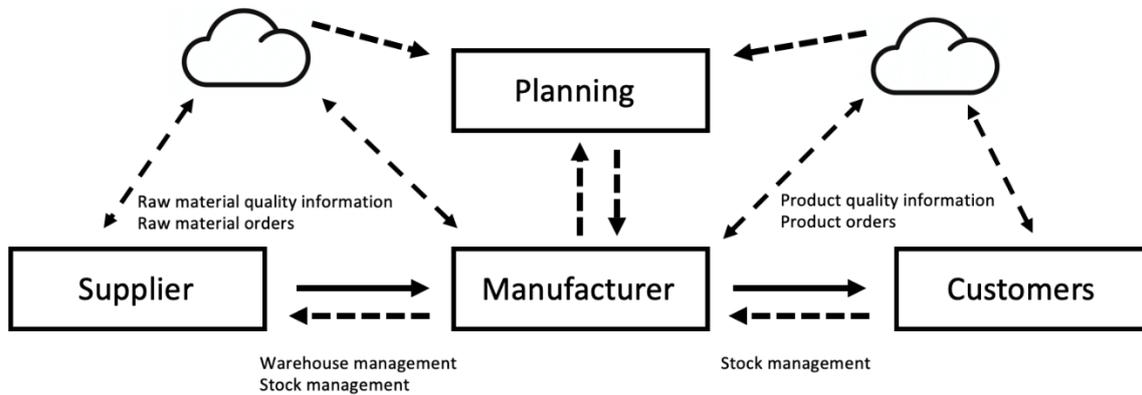


Figure 4 Company X supply chain with Industry 4.0 implementation, modified from Szozda (2017)

The introduction of above-mentioned technologies would increase both the profit margin as well as customer satisfaction. Higher quality, reduced spoilage and waste, and reduced labour costs thanks to automation and better work planning would all contribute positively to the future financial performance of Company X.

### Limitations

Connected supply chain requires that all parts in the supply chain have a contemporary architecture software to control their operations. In the media industry, there are a large variety of companies of different sizes and with unique processes. IoT solution requires the enforcement of all the stakeholders to upgrade their systems to provide interfaces and data sharing functions according to predefined standards.

Megatrends in the world drive customers behaviour in the ocean of digital video content. Watching habits can change so fast that automation might not be able to collect and analyse enough relevant data to make long term hypotheses.

### Conclusion

Industry 4.0 is an ongoing revolution and is affecting profoundly also in the media industry. TV-companies are facing continuous transformation and challenges with keeping their positions in competition with the world's leading online video services, and also the individual content creators. Media companies need to publish accurate content for their audience in a cost-effective way. Using Industry 4.0 technologies, media companies can take advantage of knowing the consuming habits of the audience. Using available data for building automated content supply chain would decrease the costs and increase the accuracy of content popularity (Hallinan and Striphas, 2016).

Industry 4.0 technologies enable companies to remain competitive, but at the same time, they require a complete transformation in the organisations. New kind of know-how needs to be increased, and business models and organisational units need to modify to face the new requirements. New technologies need to be



