

MEGATRENDS, RECENT DEVELOPMENTS, ITS IMPACT ON LOGISTICS PROCESSES AND POSSIBLE REACTIONS - A BAVARIAN PERSPECTIVE

LIEBETRUTH Thomas

OTH Regensburg - Ostbayerische Technische Hochschule Regensburg, Germany, EU,
thomas.liebethuth@oth-regensburg.de

Abstract

Megatrends have a high impact on logistics processes. Nevertheless some companies are still hesitating to start initiatives to react to it. Therefore this paper gives an overview of the impact of megatrends on logistics processes. It then gives examples of innovative logistical solutions, how companies can react to these trends and even improve processes and thus create a competitive advantage with a special focus on Bavarian political, industrial and academic initiatives.

Keywords: Bavaria, Collaborative Robotics, Digitalization, Globalization, Global Sourcing, Industry 4.0, Logistics, Megatrends, Process Improvement, Supply Chain Management, Virtual Reality

1. INTRODUCTION

The paper presents an overview of the impact of megatrends on logistics processes, examples of innovative logistical solutions, how companies can react to these trends and even improve processes and thus create a competitive advantage. The paper analyze these trends and solutions from the Bavarian political, industrial and academic initiatives perspective.

2. MEGATRENDS, DEVELOPMENTS AND THEIR IMPACT ON LOGISTICS

Megatrends have already been discussed for a while. A megatrend is a large, social, economic, political, environmental or technological change that is slow to form. Once in place, megatrends influence a wide range of activities, processes and perceptions, in government, industry and in society, possibly for decades. They are the underlying forces that drive trends. Unlike a megatrend, a trend is an emerging pattern of change likely to impact our business and requires a response. In various contributions over the past decades several megatrends were discussed: globalization, technological progress/digitalization, urbanization and polarization, demographic change, climate change and depletion of natural resources and some authors see structural changes such as long-term economic crises as another megatrend (see e.g. [1], [2]). In recent years, globalization and digitalization in particular are the most pertinent megatrends and have induced trends that lead to a deeper discussion in the field of logistics and supply chain management.

2.1. Globalization

The term globalization refers to more widely distributed value creation over different continents, countries and cultural areas. From a purchasing point of view this is advantageous as new sources can be found to increase competition among suppliers and prices could eventually be reduced. But for logistics global sourcing has several less advantageous implications, such as:

- Longer transportation distances have to be overcome
- Interfaces and coordination procedures increase
- Increased uncertainty and supply risk is created due to more complex processes

2.2. Digitalization

Digitalization can be referred to as “the use of digital technologies to change a business model and provide new revenue and value-producing opportunities” [3]. It uses the representation of any object (e.g. image, document, and signal) by generation a digital representation. For logistics, the impact is manifold. The most important factors seem to be:

- Firstly a bigger amount of data to control logistics processes is available real-time. For example, information on the consumption of material used for production can be easily gathered via barcode-scans. So, real-time process controlling enables the replacement of inventories by information and thus avoiding waste in logistics processes.
- Secondly, by using cloud-solutions (see [4]) in logistics, new cost structures are possible. Instead of buying and maintaining IT solutions, it is possible to lease and pay a higher share of variable cost on a monthly basis. This gives companies the opportunity to adapt to changed demand and at the same time always use the latest software.

3. BAVARIAS EXPOSURE REGARDING THE MEGATRENDS AND ITS INITIATIVES

Bavaria is an important “Bundesland” in Germany regarding economic development and likes to be seen as an economic forerunner. To understand the economic and political environment before explaining specific company examples, the economic structure and political initiatives in Bavaria are explained.

The industry structure in Bavaria is highly dependent on the automotive and machinery industry. The automotive and machinery industry accounted in 2013 for nearly a third of the industry workforce (with the industry itself accounting for nearly a quarter of Bavaria’s total workforce) and over 44% of the turnover of Bavaria’s industry [5].

To foster the above-mentioned industries, the Bavarian government puts a great deal of emphasis and creates a fruitful environment for industrial development. An example of this is a digitalization initiative that aims to link digitalization projects within Bavaria [6]. It covers ten points. Among them is the creation of a center for digitalization in Garching that involves the creation of 20 new professorships in this field. The goal is to support and develop different platforms such as a platform for cyber-physical systems in manufacturing (Industry 4.0) and a platform for autonomous driving, with the A9 from Nuremberg to Munich being a test track for such vehicles.

Other points cover topics such as the development of digital learning in schools, fostering start-up centers in digital business, research into cyber-security or the refurbishment of the digital infrastructure in Bavaria in the form of fast internet connections in every corner of the state.

4. SELECTED EXAMPLES OF BEST/INTERESTING PRACTICES

In this section, three examples are shown of how companies react to the above-mentioned trends and developments to either cope with the challenges or use the new possibilities to develop a competitive advantage in the market. Firstly the company initiative is presented and secondly its impact on logistics processes is explained. To explain the impact on the processes generic process improvement principles are used. This implies a processual perspective of logistics and supply chain management (see [7]).

An analysis of generic process improvement principles in contributions in the field of logistics and process management (see [8], [9], [10]) showed the following results:

- Eliminate: remove process steps in order to decrease the number of resources needed
- Parallelize: perform two or more activities at the same time to decrease throughput time
- Change order: reorganize the process steps to decrease interfaces or smoothen process flow

- Segment: differentiate processes according to process characteristics or customer requirements
- Bundle: increase capacity usage of trucks etc.
- Level/Stabilize: equal out fluctuations of input factors or capacity usage
- Mobilize: decrease throughput times (e.g. by lot size 1) and thus increase flexibility
- Standardize: harmonize interfaces, data types or infrastructure elements (e.g. pallets)
- Automate: use machines instead of people and thus use economies of scope and scale and better cost structures
- Digitalize: transfer or transform physical information into digital content and increase availability in digital media (e.g. Internet, cloud)
- Create transparency: structure, visualize and/or measure processes
- Motivate staff: increase willingness of staff to perform work in a more effective and qualitative manner
- Value orientation: increase overlap of product/process result with customer expectation

4.1. Reorganization of logistics infrastructure in an automotive plant due to global sourcing

Due to a strategic decision of the BMW AG to increase the global sourcing share to 40% of all purchased materials in terms of volume, the plant related logistics-infrastructure had to be adapted. For the Regensburg plant where several models are built on one flexible assembly line, this meant that it had to build a new and larger logistics service center to cover the supply risks associated with global sourcing. In the first place such a logistics service center can be seen a waste in the sense of lean production. But at a second glance such a logistics service center offers multiple possibilities to improve logistics processes:

- A higher share of inbound logistics and even some pre assembly activities can be bundled at the logistics service provider, which has due to his network and experience better process know-how and better cost structures.
- By having most of the material closer to the assembly line, more efficient small train routes can be used to feed the lines and thus space at the assembly line can be saved, although the number of material codes has increased.

The above mentioned possibilities are based on the principles of bundling and to some extent a change of the processes order. Another principle that can be observed from the point of view of the assembly line a stabilization of processes as the frequency of supplying the assembly line can be increased, whereas the amount of each supply can be reduced.

4.2. Industry 4.0 at an automotive supplier

Industry 4.0, Advanced Manufacturing or Internet of Things can be described as the linking of resources, objects and humans to so called "Cyber-Physical Systems". A major aspect of those systems is the intelligent and self-controlling exchange of information and interaction. The development of Industry 4.0 goes along with the development of better possibilities to gather and process real-time-data. Therefore it can be seen as a technology-push-innovation, which still needs to prove its usefulness in practical applications (see [11], [12]).

Here, an approach of the Continental-plant in Regensburg is shown (see [13]), whose take on this concept is the implementation of Industry 4.0 on a project basis. Three examples can be shown:

- Collaborative Robotics can generally be defined as robots are working together with humans. This is becoming possible with the use of new sensor systems and interactive surfaces that prevent harmful accidents without complicated security systems. Thus, companies can make full use of robot's possibilities of higher precision, better cost structures and performing activities that would be too dangerous or difficult for humans. Continental has implemented collaborative robotics at some workplaces in the production. A next step will be to use robots in combination with driverless transportation systems in logistics processes.

- Disposition of materials can be simplified and made more accurate by using real-time information on the consumption of goods. Continental uses this principle in the maintenance of machines together with the supplier of specialized production machines that has installed an automated spare-part-dispense that sends the information on spare-part consumption directly to the supplier via an internet connection.
- Augmented Reality is the enrichment of reality with other information. This can be realized by projecting additional information to glasses or in the car on a head-up-display. Continental uses this principle in the maintenance of machines. Instead of having an expensive engineer coming to repair a machine, a less qualified technician will physically perform the repair operation. But he is connected to an engineer that firstly sees the real-time-pictures and secondly can send information on the location of parts on the glass of the technician.

All the shown examples are based on the principle of digitalization. In the first example the principle of automation and segmentation is also applied, whereas in the second example the consumption and the information exchanged are parallelized to increase the accuracy of the replenishment, which is also the principle in the third example that enables also to save costs by eliminating the travelling of engineers and more effective use of the engineers time (bundling).

4.3. The use of virtual reality in logistics

Virtual reality, the computer-simulated life or immersive multimedia, artificially creates sensory experiences which can include sight, hearing or touching by using devices such as glasses, headphones or even haptic devices that can simulate tactile information. One of its main advantages lies in the training sector as for a man's brain it does not matter whether something is seen in reality or projected on a screen.

Areas of applications are thus - besides gaming - training of activities that are either too dangerous for humans to train in real situations such as pilot, military or submarine training or activities that are too costly to perform in the real world such as building a house. Especially in training situations virtual reality can be combined with gesture commands and instant feedback as in virtual reality glasses gesture command cameras and eye-tracking devices and can be relatively easily be integrated. It becomes thus possible to easily assess if the trainee has achieved the training goals. For example if a technician is to be trained to check screws of a machine in a certain order, this can be simulated in a virtual reality environment and the actions and eye-movements of this person can be surveyed in a safe and objective manner.

In cooperation with a company that offers virtual reality solutions in gaming and for industry clients, students of our faculty has identified in a workshop a number of possibilities to use virtual reality in logistics:

- Development of logistics workplaces in an interactive manner in a virtual reality environment
- Simulation and training of logistics processes such as a small train roundtrips
- Virtual visits to best "best practice facilities" without having to travel there

Although the virtual environment has to be prepared beforehand, the above described possibilities build also heavily on the principle of digitalization as the whole real environment is digitalized. But in addition to that other processes such as travelling and blocking of "real" capacities can be avoided or eliminated to achieve the desired outcome.

5. CONCLUSION

Recent trends induced by megatrends have a strong impact on logistics and supply chain management. Companies have especially to observe developments in globalization and technological progress. Bavaria is exposed to those developments as its automotive and machinery industries are globally active and thus exposed to global competition. But it has launched political initiatives to make better use of the internet of things and to cope with globalization of markets to achieve a competitive advantage.

Nevertheless, especially the impact of solutions in the field of digitalization is not clear yet. And as it is more a technology-push innovation, it is necessary for companies to explore possibilities to incorporate the new possibilities into their processes to stay ahead of competition and analyze and understand how processes can be improved by using the new possibilities.

REFERENCES

- [1] NAISBITT J. Megatrends. 10 Perspektiven, die unser Leben verändern werden. München: Heyne, 1986.
- [2] HORX M. Das Megatrend-Prinzip. Wie die Welt von morgen entsteht. München: Pantheon, 2014.
- [3] Digitalization. Gartner IT Glossary. [07.05.2015]. Available from: www.gartner.com.
- [4] DELFMANN W., JAEKEL F. The Cloud - Logistics for the Future. Diskussionspapier. Bundesvereinigung Logistik. 2012.
- [5] STMWI. Bayerns Wirtschaft in Zahlen. Bayerisches Staatsministerium für Wirtschaft und Medien, Energie und Technologie. 2014.
- [6] AIGNER I. Bayern Digital - Innovation fördern, Wachstum sichern. Regierungserklärung. Bayerischer Landtag. München. [07.05.2015]. Available from: www.bayern.de/bayern-digital-innovation-foerdern-wachstum-sichern.
- [7] OTTO A. Management und Controlling von Supply Chains. Ein Modell auf der Basis der Netzwerktheorie. Wiesbaden: Deutscher Universitätsverlag (Neue betriebswirtschaftliche Forschung, 290). 2012. Available from: <http://dx.doi.org/10.1007/978-3-663-10716-3>.
- [8] KLAUS P. Logistik - Flow Management. Nürnberger Logistik-Arbeitspapier, No. 8, 2003.
- [9] SCHULTE-ZURHAUSEN M. Organisation. München: Vahlen (Vahlens Handbücher der Wirtschafts- und Sozialwissenschaften), 2010.
- [10] STÖGER R. Prozessmanagement. Qualität, Produktivität, Konkurrenzfähigkeit. Stuttgart: Schäffer-Poeschel, 2011. Available from: <http://site.ebrary.com/lib/alltitles/docDetail.action?docID=10555927>.
- [11] JESKE T. Industrie 4.0 in der Produktion - Grundlagen und Gestaltungspotenziale der Produktionsarbeit 4.0. Zeitschrift Führung + Organisation zfo, No. 3, 2015, pp. 152-156.
- [12] TSCHÖPE S., ARONSKA K., NYHUIS P. Was ist eigentlich Industrie 4.0 - Eine quantitative Datenbankanalyse liefert einen Einblick. ZWF Zeitschrift für wirtschaftlichen Fabrikbetrieb, No. 3, 2015, pp. 145-149.
- [13] LIEBETRUTH T. Projekte im Bereich Industrie 4.0 im Werk Regensburg der Continental AG. Interview mit Markus Fischer. Regensburg. 21.07.2015.