DIGITALISATION IN LOGISTICS AND THE ROLE OF CLOUD COMPUTING

How Cloud Computing will Change the Game

Marisabel Gomez
marisabel.gomez@students.fhnw.ch

Shanti Grand
shanti.grand@fhnw.ch

Prof. Dr.
Stella Gatziu Grivas
stella.gatziugrivas@fhnw.ch

Competence Center Cloud Computing, School of Business, FHNW

Today in the era of digitalisation Cloud Computing is ubiquitous and the speed of the transformation of business models in several industries because of cloud is more and more accelerated. The logistics industry is characterised by many actors which must be integrated along the supply chain. This makes the usage of cloud computing a very promising issue.

All over the years a number of innovations like new machinery, packaging, and usage of algorithms or process reengineering have influenced logistics and the way logistics processes are executed. The logistics ecosystem has become more and more complex and new actors such as logistics service providers become an integral part of it. IT systems play a significant role as they allow to access, analyse and process information to support decision making.

Along the supply chain in logistics, a flow of goods and also a flow of information take place all over the times. Information flow takes for example place starting with a customer's expectation, going via retailers over distribution centres to the producers and right up to the suppliers. On all levels information has to be shared, to enable supply chain visibility and build the basis for important decisions. However, the high grade of heterogeneity in this ecosystem hinders the integration of different IT-solutions. For this reason a continuous, visible and efficient flow of information along the supply chain has not been reached yet.

In the following Figure 1 an illustration of the logistic ecosystem is given including several involved partners as well as the flow of goods and flow of information.

Today in the digitalisation era the logistics industry has plenty of potential to be transformed and cloud computing is an important factor. Increasing demands from customers, pressure on prices, fuel costs, e-commerce, and environmental awareness among others have raised the bar by which logistic activities are measured. Efficiencies in the processes and use of resources are today a must.

Gartner[1] defines digitalization as "the use of digital technologies to change a business model and provide new revenue and value-producing opportunities". Digital transformation does not only mean to use technological devices and to push paperless processes. It implies a variety of changes in a company's strategy, processes and organisational culture through the usage of technology.

Technological advancements such as increased computing power, penetration of broadband internet access or hand-held devices gave the impetus for digitalisation. Trends like the internet of everything, where things start to communicate directly with each other and become autonomous, allow new levels of automated processes. Continuously increasing collection of data brings new factors of differentiation and new business models. First tests in different countries with unmanned aerial vehicles (UAV) open a complete new way of transportation. These changes are shaping industries globally. The logistics industry can also profit from these innovations, however, it is marked by the large number of involved parties along the supply chain which brings new challenges of integration. Although many standards such as container sizes, the Serial Shipping Container Code or the

[1] Gartner, "IT Glossary," 2013. [Online]. Available: www.gartner.com/it-glossary/digitalization. [Accessed 2 October 2015]

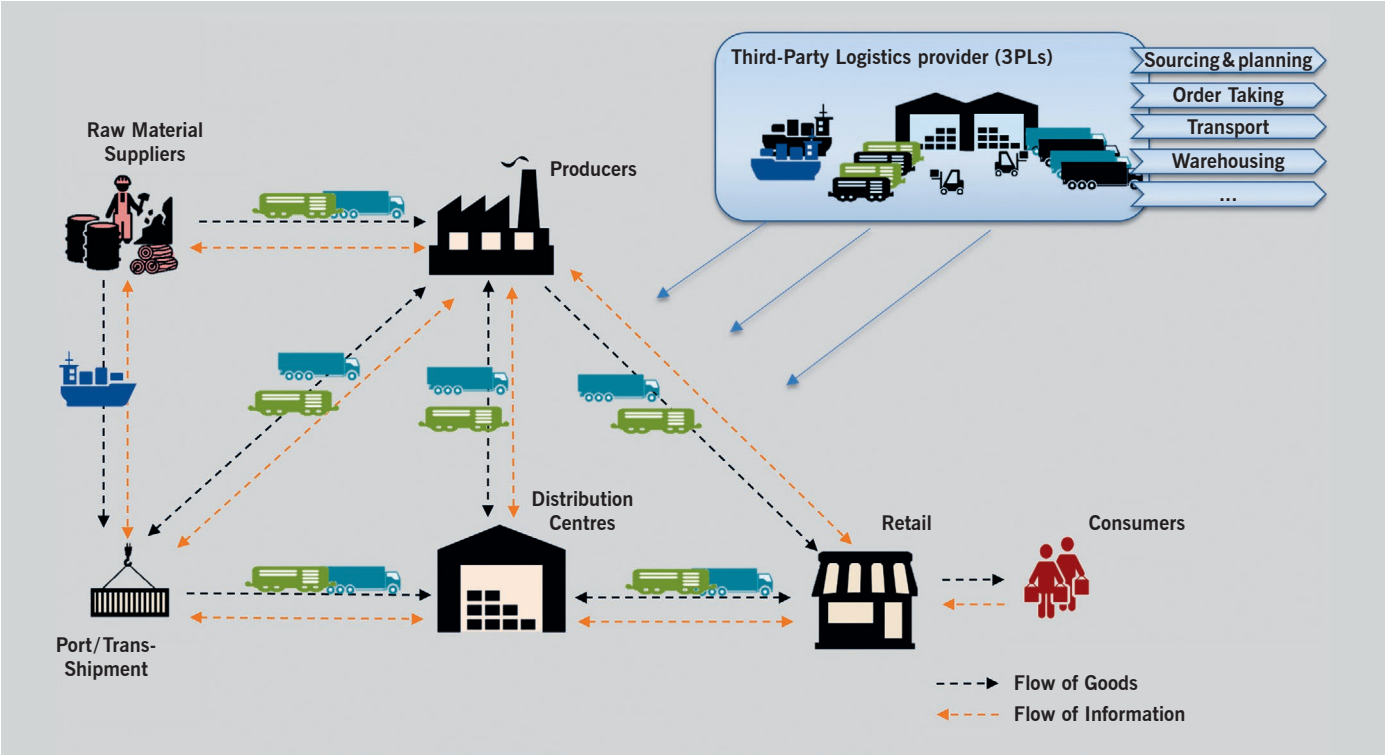

Figure 1:
The logistics ecosystem
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electronic data interchange (EDI) have been established, the industry procedures remain very heterogeneous.
Cloud computing, as one of the forces for digitalization, can foster collaboration among the parties in a supply chain, can promote innovation and embed it into organizations, and enable new competitors to enter the market with innovative offers.

Cloud as enabler for digitalisation supporting collaboration and integration

Cloud computing has the potential to bring together the various players in the logistics industry and to make a continuous flow of information possible. A standardized cloud system could facilitate a logistics company's IT-integration with partners, customers and suppliers. Instead of integrating a variety of distinct IT-systems and standards, a company would only connect once. Involved actors could be integrated through this cloud easily using same standards and channels. Figure 2 shows an illustration of a possible Cloud System for the logistics industry. Such integration would provide more recent and more accurate data and therefore increase supply chain visibility. However, it could also become a smart system where big data and the internet of things (IoT) are involved. By using real time data and tracking systems more accurate forecasts become possible.
Increasing complexity in supply chains is also provoking more and more specialization of service providers and by that an increased fragmentation of logistic services. While providers specialize on partial steps of the supply chain new business models like value-added logistics or 4th party logistics arise. Under the digital transformation umbrella, the use of cloud technology could be exploited to master the challenge of integrating new actors.

Promising initiatives like the digitalization of the port of Hamburg[2] illustrate the role of cloud computing as well. 270 km fiber-optic cables, a sophisticated mobility concept and the interaction of big data and cloud systems allow a high degree of real-time data and transparency along the supply chain. In this way all involved parties have access to current measured values. In the case of weather incidents or accidents in the port area this information allows for immediate reaction by invoking relevant authorities and parties to help prevent further damage. An important focus lays in the interplay of technologies and processes to increase energy efficiency but also cooperation between the authorities and the various instances of the port. While the IT infrastructure needs to be reachable within a short time in the case of an emergency, it should not waste resources during normal operation. The use of cloud computing with its elasticity ensures that costs are held low and capacity dynamically adopted when needed. This is a typical advantage of cloud computing: fast access to services and infrastructure when needed without prior large investments.
A further trend that benefits from cloud systems is the introduction of so called container portals. Such portals allow to organize shipments in a completely new way. Binding offers and prices, as well as information about routes or previous shipments can be directly accessed. Important documents can also be generated round the clock and requests do not need to be made by phone or fax anymore. The internet makes such portals possible, however cloud computing offers new possibilities of collaboration and new ways to integrate different actors of a supply chain resulting in increased visibility and transparency. Through the use of hybrid clouds important confidential data can now be protected from unauthorized access.

[2] blogs.cisco.com/ioe/video-showcases-hamburgs-digital-smart-city-port-connection

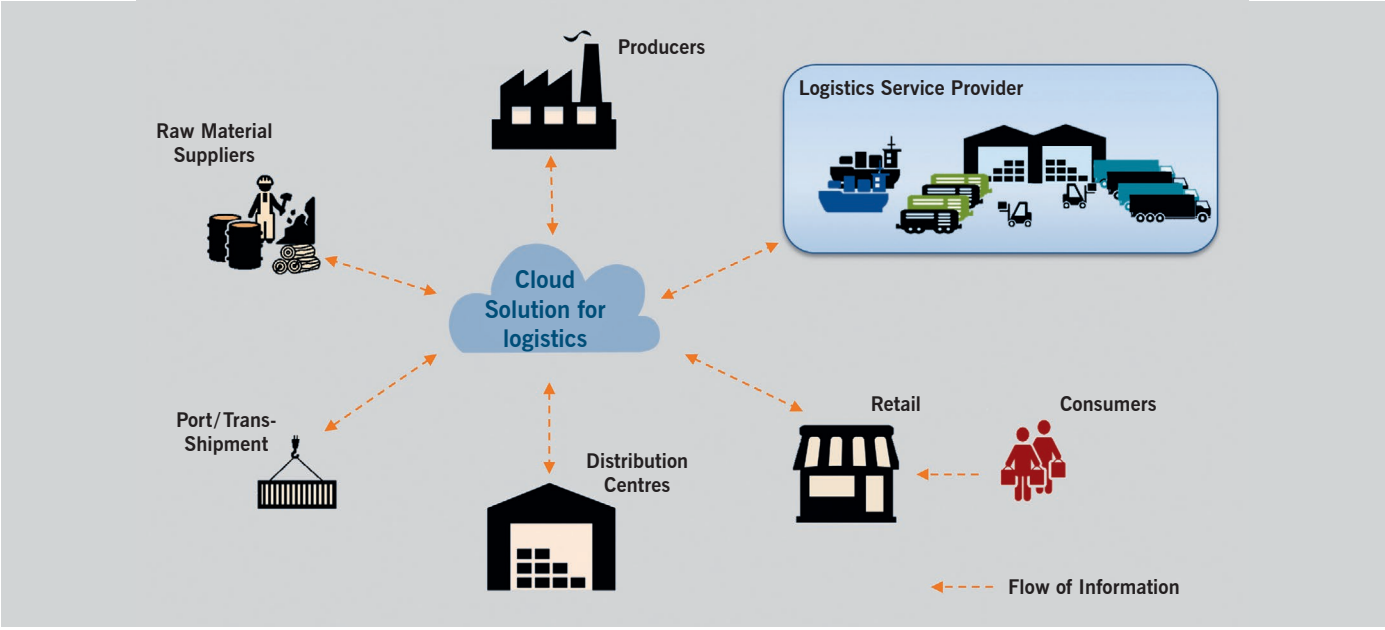

Figure 2:
Possible Cloud System for Logistics Industries
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More examples can be found in projects like LOGICAL3, a European project that aims to merge services from different logistics providers in one cloud platform in order to offer them as integrated services to customers. It entails gathering information from all the logistic providers' services, creating rules to combine them in order to fulfil customers' requirements, and allowing customers to book these as one service. This creates a new way of collaboration by employing unused resources from different suppliers, that if divided would otherwise not have the means to enter or compete in this market.

An integration of actors along the supply chain through cloud systems gives everyone access to essential information and helps to synchronise supply chains. Capacity and allocation management become more efficient by fully utilizing available assets and resources. Production planning can be done globally giving companies better control, providing an overview or high tower like visibility, which in turn gives companies more flexibility within the supply chain. By integrating all the parties of a supply chain with cloud technology and software, it is also possible to calculate the carbon footprint of the whole supply chain. Currently only those parties that are required by law are measuring the CO_2 emissions, but only by integrating the whole supply chain, from the suppliers or producers up to the last link in the chain, can green initiatives be taken and a real impact be made. Furthermore, the integration of the supply chain and collaboration between logistics providers can also provide reduction of empty mileage, poor vehicle routing, and traffic, having as consequences less environmental pollution and better on time delivery. Finally, the use of cloud computing technology reduces energy consumption overall as assets are shared and fully utilized.

The Challenges

Like in other industries, cloud systems can facilitate the use of new technology without the need of large investments but the road to using and implementing new technologies in the industry is not paved yet and factors exist that slow it down. Legal requirements and regulations vary from country to country, which makes standardization of processes almost impossible. Communication standards vary between the different parties of the supply chain, and are not yet fully established for the communication of things (IoT, data exchange). Companies lack trust in new technologies and are fearful of sharing data with other parties or hosting IT outside the company boundaries. New questions such as data security arise with the use of cloud, but private and hybrid cloud systems could solve such problems and provide secure environments. Finally, these experiments require large amounts of capital and other resources that many do not possess or are not willing to risk.

In order to push digitalization further, the industry needs the desire to integrate different players and to share a common vision. However, integrating all players acting in a product life cycle is a challenge especially when processes are not standardised. For instance the operation of loading and unloading vessels or trucks varies. Some companies still use papers and require manual signatures while others have been able to digitalize this step with supporting mobile devices. An interaction of these two companies interrupts the flow of digitalized data and can result in more expenses. The digitalisation requires the industry to pool resources and to build mutual trust and commitment towards a common goal.

Furthermore, standardized and automated processes may not be enough. Processes need to be revolutionized by applying new thinking to leverage all the new technology available in order to create new opportunities and tackle problems that the industry may not even be aware of.

Cloud one of the main pillars for enabling digitalisation

Cloud brings similar advantages to all companies that utilize it, but alone it is not the answer to revolutionising

[3] www.project-logical.eu/?lang=de

the logistics industry. It can be one of the enablers when paired with other existing and emerging technology and embedded within the entire movement of digitalisation. It can bring many benefits not only to the companies using it, but also to customers who demand tailored solutions and faster information. A possible outlook for cloud computing as an enabler of digital transformation in the logistics industry is the possibility to analyse real time data from mobile sensors in smart cars or chips and sharing of information over company boundaries. Together these approaches can improve processes related to track and trace or can support exception management when something does not go as planned. Further examples are improved communication with authorities related to customs clearance and security checks or with customers to inform them of missing information, issues with their shipments, or trade compliance breaches. Advancements in data management and analytics of big data also offer possibilities to learn from the past and to predict future seasons. In the end such improvements and advancements can increase supply chain transparency. Through the access to real time data and improved interaction facilitated by cloud systems, more efficient planning and allocation of resources will be possible. Factors that affect the logistics like environmental disasters, political instabilities, and regulations become more predictable, apparent and can be included in own calculations. The results are then timely reactions to market changes and a reduction of environmental impact of the industry.

Summarizing, no one knows what the future holds, but it would not be surprising to see an increase in the usage of cloud computing and other technology to deal with the complex challenges that the industry faces.

Stella Gatziu Grivas is Head of the Competence Centre Cloud Computing at FHNW and her current research focusses on the transformation of enterprises and ecosystems because of cloud computing.
Shanti Grand is a research assistant in the competence centre and **Marisabel Gomez** works on her MSc Thesis focussing on the usage of cloud logistics industry.

Das Thema Cloud und Logistik ist Teil des **3. Cloud Use Cases Day** am 2. Februar 2016 an der FHNW in Olten.

Informationen unter:
web.fhnw.ch/projekte/cloud-days/cloud-use-cases-days