New opportunities for logistics through cyber physical systems

The immense significance of logistics for the German economy is undisputed today, particularly in the light of constantly increasing tendencies towards internationalization and the increasingly complex structures within production, markets and competition. Logistics has developed from being purely about transportation to now play a performance-defining role in global value added networks. In this context, the internet of things and cyber physical systems for logistics are of fundamental importance towards achieving the efficiency required of logistics within global value added networks, in particular with respect to individual order processing, and towards fulfilling key supply and waste disposal tasks for households, retail and production sites.

The internet of things and cyber physical systems for logistics play a central role in dealing with the challenges facing both society and logistics. According to the modern perception of logistics, the two are inextricably linked. It was logistics that developed the vision of the internet of things more than a decade ago and made significant contributions towards realizing this vision. To put it briefly, logistics sees the internet of things as things controlling themselves: intelligent devices should learn to think and goods should organize their own route to the destinations all by themselves. When logistics first expressed this vision it was hardly to be expected that the principle of self-control would lead to a fundamental reorientation of logistics and to a revolution in business.

The internet of things has become a driver for the 4th industrial revolution which is currently on everybody's lips as the future project industry 4.0. According to Prof. Dr. Henning Kagermann, president of the National Academy for Science and Engineering acatech, "Industry 4.0 enables batch sizes of one to be produced at the same cost as a mass product, and the requirement-oriented optimization of value adding processes in real time. Active, autonomous and self-organizing production units are replacing passive, plan-oriented production systems. The intelligent product actively supports the production process. Production becomes highly flexible, highly productive, resource-preserving and urban-compatible."

Cyber physical systems form the basis for the fourth industrial revolution: informational components (cyber) and mechanical or electronic and sensory components (physical) merge with each other to form an intelligent system, a cyber physical sytem, in short a CPS. CPSs are more than an individual sensor application or an individual intelligent assistance system that helps people to
perform specific activities (an embedded system). They stand for the networking of efficient intelligent embedded systems, mobile services and worldwide data sources to form complex entire systems. CPSs use the internet as a business web, i.e. as a platform for business co-operations – with the objective of generating added value by means of new applications, new services and co-operations at the complex systems level. Cyber physical systems see the internet of things really taking shape. Connecting the virtual world of data with the physical world of goods requires an increasing merging of logistics and ICT competencies and the integration of ICT competencies in logistics.

It is an important task for logistics to guarantee the functionality of globally established production and logistics networks (supply chains). The basis for that is the complete transparency of all material flows in the supply chain which, from now on, can be guaranteed in a new dimension by the internet of things and the cyber physical systems. Such transparency enables products to be traced and therefore leads to sustainability for all the participants in a supply chain – from the supplier of raw materials right through to the consumer. Cyber physical systems play an important role also in intralogistics. Where individual and business transports are concerned, the principle of the internet of things with cyber physical systems helps to connect all transport processes with the associated information. Thus, control alternatives can be identified and efficiently exploited at any time. Further approaches in this field are the shared use of transport and logistics infrastructures (e.g. transshipment areas, distribution transportation, goods transfer systems) by companies and service providers as well as new solutions for "last mile" distribution and goods transfer.

These considerations result in a plethora of new solutions which could be the impetus for companies in the logistics sector in North-Rhine Westphalia to achieve more through innovation and research as EffizienzCluster LogistikRuhr presented in a position paper worked out by various scientist.

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