DESIGN AND OPERATION OF INNOVATION-ORIENTED LOGISTICS CLUSTERS

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Abstract - Services, informatics and innovation are enablers that influence mainly the success of business logistics both on a regional level as well as on an international level. They have to be designed and operated having in mind that world trade flows are interconnected and require considerable resilience: Logistics has to ensure distributed production in a dynamic environment on a regional and on a global scale. In line with this, any special services, offered in particular logistics clusters as a competitive advantage, playan increasingly important role in world economy: new businesses, new distributions of tasks and new value-added services in international supply chain networks have occurred and will occur in future. Moreover, new innovative control philosophies for logistics operations based on the realization of Blockchain based autonomous decentralized cooperating systems will improve the logistics efficiency in the next years. These developments are confronted with present and future challenges on climate change as well as on security aspects. Moreover, a sustainable trade off between business and living, production and logistics has to be found in such logistics clusters. Knowledge management and knowledge labs between decision makers can support the quality of the design and of the sustainable operation of these relations, and by this of the innovative design and management of usual services and of smart services.

Keywords - Knowledge Management, Logistics Clusters, Business Informatics, Innovation and Business Models

I. LOGISTICS AND THE AVAILABILITY OF DIGITALE INFRASTRUCTURE

Logistics is the promoter for a sustainable urban and regional development as well as for securing worldwide-distributed production. By this, it is important to increase the connectivity between logistics hubs on a regional and an international level as well as to increase the logistics performance in and between companies and its stakeholders within a region and within a city. Therefor it is necessary, not only to focus on physical processes, but mainly to consider improved communications and reliable cooperation arrangement as well as to emphasis on an effective knowledge management.
However, besides the upgrading of transport infrastructure, this requires especially investment in digital infrastructure (e.g. 5G and other Industry 4.0-related technologies) and knowledge arrangements. In line with this, logistics influences and will be influenced by the elaboration and distribution of new approaches in urban development, in coopetition of companies and institutions as well as in the design and use of new smart services based on web-technology for social and business activities for different citizen-relevant areas of needs.
Ideas and concepts mentioned within this context amongst others are regional knowledge management, cluster elaboration and cluster governance, urban logistics and urban sourcing, additive manufacturing, cloud logistics, cyber-physical systems, demand chain management, sharing of resources, services on demand as well as crowd transportation and crowd logistics.
From the points of view of acceptance and enforceability it seems that for the elaboration and discussion of these new ideas and concepts public participation should be considered.

All developments in this spirit common are the questions related to the future design and operation of communication and cooperation between the actors necessary for the exchange of goods and the management of the supply chain. Definitions like Industry 4.0 or smart cities symbolize these new developments, which will considerable change the social life and the worldwide economic cooperation.
However, finally we have to decide about the direction and the degree of external control. A challenge that should be covered in the context of discussions about the ethics of logistics.

II. INNOVATIVE LOGISTICS CLUSTERS AGAINST THE BACKGROUND OF POLICY

In Germany, innovative logistics clusters can be seen against the background of the High-Tech Strategy 2025 of the government. This strategy focuses on the following missions of action: Technology and mobility, sustainability and environment, health and transformation. Mainly the fields of action “Mobility”, “Urban and Rural Areas” and “Economy and work 4.0” should be mentioned in this context.
Moreover the flagship initiative „City of the future“ as part of the Innovation Platform City of the Future of the German Federal Ministry for Education and Research and the German Federal Ministry of the Environment, Nature Conservation and Reactor Safety can be mentioned. In line with smart services applied within the logistics clusters there is a direct link to the Research and Innovation Agenda of the German National Platform City of the Future.

On a European level the objective of an innovative logistics cluster harmonizes with the EU Framework Program for Research and Development „ Horizon Europe“ (2021-2027). According the consultation of Member States, this program was recommended to focus on cross-modal perspective of intelligent and integrated transportation, both for public as well as for freight. In line with smart specialization strategies of member states there is a direct link to the Cluster Digital, Industry and Space addressing in particular information and communication technology(ICT) and Key Enabling Technologies.

III. CHALLENGES IN RESEARCH FOR WEB-BASED INNOVATIVE LOGISTICS CLUSTERS

Challenges in research for web-based innovative logistics clusters are related to the design, the elaboration and the operation of new process-related business models in cities and regions, based on digital infrastructure. For a successful implementation all urban stakeholders have to be considered. This can be realized by organizing workshops, think tanks and world cafes. These business models have to consider options for new living environments and for new working arrangements. These arrangements can be distinguished concerning B2B-, B2C-, C2B- and C2C-relationships. Mainly C2C-concepts cover new developments in line with sharing solutions and crowd logistics.

From the point of view of management science reference should be given to topics like business process modelling, re-inventing of business models, monitoring of business processes, the linkage of processes to actors, the ownership of processes and the related data, the distribution of returns and risks, negotiation-orientated decision models as well as to the supply chain management finance.

From the point of view of logistics research, the main concern is on new business cases and digital services as well as on new forms of web-based coopetition between the relevant stakeholders in a city or a region. For this new research results may be picked up, especially related to systems dynamics, decision management, coopetitive arrangements, digital service innovations, cluster-performance measurement and cooperative games.

IV. KNOWLEDGE MANAGEMENT AS NECESSITY FOR DEVELOPMENT AND OPERATION OF LOGISTICS PARCS AS PART OF INNOVATIVE LOGISTICS CLUSTERS

Freight villages are very widely used in the process of trade and transport in all around the world. In international bibliography, the term “Freight Village” continues to be used interchangeably with the terms: “PlatformesMultimodales/Logistiques” (France), “Interporti” (Italy), “Gueterverkehrszentren” (Germany), “Logistics Park/Logistics Center” (China), or even with the more general term “Dry Port”.

The definition freight village is accepted here as the unified name describing a defined area within which all the activities relating to transport, logistics and distribution of goods, both for national and international transit, are carried out by various operators. United Nations Economic Commission for Europe UN-ECE, defines it from the cluster perspective: geographical grouping of independent companies and bodies which are dealing with freight transport (e.g., freight forwarders, shippers, transport operators, customs) and with accompanying services (e.g., storage, maintenance and repair), including at least a terminal. In most cases, freight villages are intermodal terminals, which are the principal components of an intermodal transport chain, thereby constituting the nodes where the transshipments of goods from one mode to the other take place. Due to the integration of various transportation modes, transport and logistics companies can take advantages of common infrastructure, equipment and services, without proceeding to heavy and risky investments if they had to choose the “individual” use. Apart from using public heavy and risky investments like intermodal, located companies can cut cost from such aspects: reducing marketing cost because of the clustering’s conveniences and brand power for absorbing customers; reducing investments in infrastructures like warehouse and yard-crane by the co-construction with other freight village members; joining co-purchasing of energy like electricity to get a cheaper price; reducing emptying truck journey through consolidated transportation with other allied freight villages members.

Along with worldwide progressive development of logistics industry, the importance of logistics parks is growing in the supply chain management efficiency aspect. Logistics park is a fundamental facility of the logistics system, which has become one of the major methods to promote the logistics industry and its positive effect will continuously grow for a long period of time. Recently, climate change and environmental concerns on logistics issues have been increasingly discussed. Contemporary trends of European strategies are established on mobility and transport toward sustainable energy and green transport. It is therefore necessary for us to emphasize sustainable development in logistics area. Meanwhile, the era of knowledge-based economy suggests that knowledge is central to how organizations learn and manage technologies. Knowledge management is viewed as the set of the technologies, techniques and procedures that are used to assist the creation, access and reuse of knowledge in a collaborative environment.

A successful knowledge management project concerns analysis and planning, knowledge sharing and access, culture and process, and other non-technical factors. Now, logistics park building is one of many efforts to encourage a country's logistics industry. While on the other side, it brings negative impacts, such as misuse of land, destruction of species, wasting of resources,

sewage disposal and so on. As a complex, multi-disciplinarily, inter-organizational organization, logistics park's sustainable development with involvement of knowledge management solutions should be part of logistics research. The motivation comes from since shipping companies and in general international supply chain activities are shaped by a dynamic and information intensive environment, for companies involved knowledge management is essential.

Interest in knowledge management from both industry and academia has been growing rapidly, for it provides a wide variety of methods and tools for creating and acquiring, storing and retrieving, exchanging, or using and re-using knowledge as a strategic resource. It involves the support of a technological infrastructure, a change in organizational culture and the management of different types of knowledge.

The benefits of knowledge management are traditionally focused on:

- Reducing cost and risk
- Leveraging existing assets to reduce cost, risk and cycle time
- Improved decision making
- Improved strategic planning
- Faster development of new technical approaches
- Faster more Robust Problem Solving
- Reduced cost of employee training
- Increased versatility of the workforce.

Knowledge management implementation framework should provide a balanced view between a technological and a social approach to knowledge management. If this issue is not adequately addressed, there may be an inherent tendency for practitioners to take an overly narrow approach towards implementing knowledge management.

Regarding such opinions, for high efficiency of sustainable development in logistics parks, knowledge management could be implemented in such dimensions:

(1) Knowledge management &learning organization

According to population policy and education concept based on sustainable development, to improve people's quality includes both scientific education level and renovation ability, and enhancing propaganda and education on sustainable development ethics and moral concepts, raising the public's environment awareness and resource consciousness. To be adapted to this strategy, learning organization is becoming increasingly important organizationally to this matter.

Effective learning is associated with increased information sharing, communication, and understanding. Today, learning organization emerges as a reformational organizational management, and the knowledge management infrastructure is essential to support learning organizations. Knowledge management infrastructure, tools and technologies, provide the platform upon which learning can be built.

Ecological awareness-raising and education campaigns play an important role in influencing implementation of sustainable development strategy and facilitating sustainable logistics park choices. Actually, that is learning organization supported by knowledge management solution paves the way for ecological awareness-raising and education.

(2) Information processing and knowledge management solutions

Since information systems development activities are knowledge-work activities, the information-processing view of knowledge management has been prevalent in information systems practice and research over the last few decades.

Moreover, as known, the five major areas of logistics are production, inventory, location, transportation, information. Information as a tie point between logistics and knowledge management, and it is the basis upon which to make decisions regarding the above four areas, as well as the connection between all of the activities and operations in a logistics system. Knowledge management has already featured in mainstream information processes such as vehicle, warehouse or equipment operations, order management, or tracking and tracing.

From the above, we can know that, the information-processing paradigm has been prevalent over all the operations in term of logistics park's sustainable development that have been characterized by technology intensive, optimization-driven, efficiency-seeking organizational change. Operators form logistics parks should be given better information on the reasoning behind policy decisions and on the available alternatives, also a better understanding of concepts or of technical factual matters optimizing resource utilization and reducing burdens for environments.

(3) Technological innovation and knowledge management solutions

Science and industry are already very active in the purpose of finding out solutions for transport safety, fuel dependency, vehicle emissions as well as network congestion. Following technological advancement, intellectual technology and technological innovation began to perk up the industry automation. Innovative is defined as the application of knowledge in a novel way for economic benefit.

In view of the trends in world population and global logistics industry booming, there is a significant need for a technological shift towards lower or even zero emission vehicles and packaging materials and containers recycling, and also for the development of alternative solutions for sustainable transportation, inventory, and green production in logistics parks.

Considering the ecologization, a logistics park cannot develop sustainably without the involvement of spe-

cific innovative contributions of ICT on energy efficiency and green production, application of circulation technology and reserves technology, e.g. RFID technology has opened new opportunities for managing cargo and cargo properties. Besides, ICT based on technological progress can assist the controlled and safe transport of outsize or dangerous goods through sensitive infrastructure like cities, bridges or tunnels where linking logistics parks and ports of destination.
Recognizing that technology is a critical ingredient in the sustainable development recipe according to what is mentioned above, we devise an operational knowledge tool that can help determine which technologies are best suited to the needs of a sustainable society.ICT and its innovation are often regarded as the enabler for the effective and especially efficient implementation of knowledge management.

(4) Intermodal transportation and knowledge management solutions

There is growing interest in sustainability and its implications for transport planning, which has expanded to include more emphasis on non-automotive modes and more consideration of factors such as environmental impacts and mobility for non-drivers. Transportation modeling techniques are improving to account fora wider range of options (such as alternative modes and pricing incentives) and impacts(such as pollution emissions and land use effects). Under this situation, intermodal solutions in freight transportation more and more play an important role as innovative paths for increasing operations and transportation efficiency, and it is becoming a necessity for reducing environmental impacts on logistics park's level. Nevertheless, an efficient set of means within intermodal transportation lies on flexible and adequate knowledge management to solve problems and enhance optimization. In general, knowledge management principally handles such aspects:

- Provide relatively inferior alternatives for intermodal solutions, for example, automobile dependency reduces the range of solutions that can be used to address problems such as traffic congestion, road and parking facility costs, crashes, and pollution.
- Quick responses among cooperating organizations by transmission of knowledge including explicit knowledge and implicit knowledge.
- Better monitor, evaluate and forecast for intermodal transportation planning process.

V. INNOVATIVE LOGISTICS CLUSTERS AS ENABLERS FOR REGIONAL DEVELOPMENT ALONG INTERNATIONAL TRANSPORTATION CORRIDORS

One of the major international challenges in logistics and transportation worldwide are the EUR-ASIA new silk roads focusing on transportation corridors between Asia and Europe. These corridors give the chance both, to operate cost- and time-efficient, green and secure transports between Asia and Europe as well as to realize regional developments by providing modern infrastructure and logistics concepts.
In line with this, the provision of digital infrastructure plays an important role for the design and the operation of international supply chains. By using digital infrastructure knowledge hubs, web-based or cloud-based logistics clusters, information platforms and software applications can be provided ensuring the reliable communication between partners and the coordination of interconnected logistics and transportation processes.
Moreover, the steps towards the implementation of new concepts like cloud logistics, cyber-physical systems and self-controlled transportation processes as well as demand chain management concepts can be prepared, supervised, monitored and escorted.

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