WHOLE CHAIN MANAGEMENT (WCM) - THE NEW CONCEPT - THE NEW COMPETITIVE ADVANTAGE

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Abstract

Up to now, all the supply chain concepts (LARG, SCM 2.0, Sustainable) have been solving the efficiency of satisfying customer wishes in the supply chain by analysing the efficiency of particular chains or its interactions. The most important practices and methodologies were integration, process management, production value added, automation, leanness, agility, resiliency etc. responding to the actual business environment. The potential of these attitudes have been almost exhausted. Thanks to the system thinking, discovered in 50´s, there is the opportunity to use the new methodology, solving supply chains not only as interacting parts but as the unified whole with the one goal, KPI and methodology. This new concept supports not only doing things right but even during the right things. The whole, Whole Chain Management (WCM), could efficiently and effectively solve problems, such as partial optimizations, partial KPI´s, management of separated parts instead of unified wholes, solving of the opposing goals either in one department or chain in supply chain, etc. None of them has been systematically solved yet. The new methodology could complement analytical approach by synthetic approach solving the properties of the wholes and its utilization for the management of all operational, tactical and strategic processes guaranteeing successful business results - satisfied customers.

Keywords: Supply chain management, demand chain management, system thinking, wholeness

1. INTRODUCTION

System thinking introduced to the technical sciences in 50´s could be used for management of social systems as management of chains fulfilling the final customer wishes. System is described as the whole with the properties which none of its parts have. System is not possible to divided into individual independent parts and its properties are derived from the cooperation of the particular parts, not from the performance of the isolated parts. However most of the supply chains, social systems, are currently managed by particular optimization of the individual parts and their integration in the whole, without the consideration of the real properties of the whole. Current supply chains are managed and optimized to maximize its particular output without interconnection to the properties of the whole. All current supply chain management concepts (LARG SCM, Sustainable SCM, SCM 2.0, Demand chain) have the same logic, just analytical attitude and for the purpose of this paper could be all seen as Old chain management (OCM) concepts. The proposed new conceptual framework, whole chain management (WCM), complete understanding of the wholeness by synthesis and solve the problems such as particular optimization, solving of opposing goals in the supply chains, following just partial KPI´s, etc. The goal of the article is describing the importance of wholeness (fusion of analysis and synthesis) to create systematic interconnection of currently managed independent parts. Wholeness emphasize the properties of wholes, derived from the superior system, which is researched system a part of. Propose concept will be verified on the practical example of management of chains in automotive industry.

2. LITERATURE REVIEW

System thinking has roots in General System Theory, GST [1]. Its goal is the formulation and derivation of those principles which are valid for systems in general. They are of physical, biological or sociological nature. It could be called as the general science of the whole. In modern science, GST presents the focus on interactions of the parts of the system creating the whole, replacing the previous era of Descartes's scientific reductionism focusing on the analysis of the properties of the parts creating the whole. After the introduction of GST in 50's, the main focus of system thinking development was oriented on cybernetics or technical systems [2], [3]. The sociological part of the systems thinking development has become relevant from the 90's [4]. Interactions between the parts creating the whole systems are the corner stone of the systemic thinking used in social sciences, which understands synthesis as tool to create the whole after taking the system apart by analysis [5]. Ackoff proposed an altered definitions of the system, which are used in methodological part describing system thinking [6]. Such an understanding of the synthesis and ability to understand is critical but has not been applied in the social system yet. Latest development of the supply chains management concepts, especially LARG SCM, describes the strong correlation between changing conditions in business environment and aspiration of academic sphere to develop the new and efficient SCM attitudes [7, 8, 9]. Christhoper argues to change the logic of managing of supply chains because of enormous variability and increasing turbulence [10] and utilization of customer oriented principal by implementation of pull principle not only between customer and marketing department of the final producer but even in the all previous chains and processes [11]. The latest Sustainable SCM (SSCM) is defined as a wise balance between economic development, environmental stewardship and social equity [12] or equal balancing for economic stability, ecological compatibility and social equilibrium [13]. SSCM is conceptualized as the strategic, transparent integration and achievement of an organization’s social, environmental, and economic goals in the systemic coordination of key inter organizational business processes for improving the long-term economic performance of the individual company and its supply chains [14].

3. DESIGNED METHODOLOGY

The system is the whole which is not possible to divided into independent parts. The essential properties of any system, the properties that define a system, are properties of the whole which none of its parts have, the essential property of the system originates outside the system, not inside. System thinking is the fusion of analysis and synthesis. Analysis has 3 steps. The first is taking system apart. The second is understanding the parts taken separately. And the third is to aggregate understanding of the parts to understand the whole. Synthesis has 3 steps. The first is identification of the superior system, where is researched system working. The second is understanding of the superior system. And the third is identification the role or the function performed in the upper system. Up to now, there has been focus in the OCM to the analytical attitude only. (see **Figure 1**). Synthetical part should be add to complete the whole understanding. However, there is common misunderstanding that synthesis is only collection of analytical facts. Due to this misunderstanding, the wholeness loses 50% of its identity. System is the whole with the properties, which none of its parts have. Furthermore, the properties of the superior system depend on the properties of the interactions of the parts, not on the properties of the parts taken separately. Technical system, an automobile, has the superior property to move from point A to point B. None of its parts can do that separately, even the engine. Using only the 3 steps of analysis to technical system an automobile, causes the loosing of the property of the whole and importance of the interactions and properties of the parts as well.

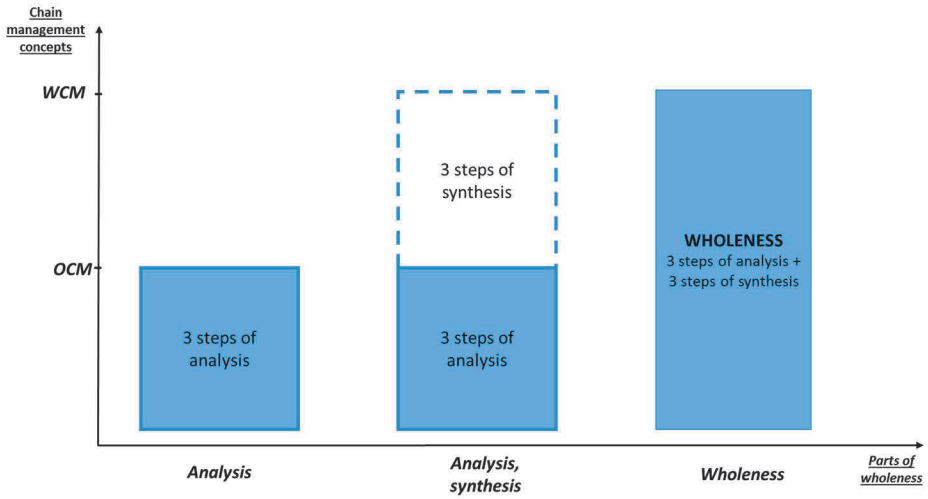

Figure 1 Relation of part of wholeness to management of chains

Understanding the wholeness due to synthesis needs 3 more steps. Identification of the superior system, where the examined system is working. The superior system in the case of the car is the society which is using the cars. Second step, understanding the superior system. Superior system is using left side driving, right side driving or the average number of people in average family, representing the number of seats in the car. The car in concrete society needs to have proper side of driving and proper number of seats derived from the superior system which is car a part of, the concrete society, for example. OCM concepts are using just 3 steps of analysis to manage the chain in management of particular chains. The importance of understanding of the context and wholeness in managing of the chains will be described in two critical assumptions.

Assumption 1. OCM solve all the important aspects of managing of supply chains analytically by separation of the supply chain in to individual chains (suppliers, forwarders, logistics services providers, producers) and then separated each chain to its particular departments (purchasing, quality, logistics, production, expedition, marketing etc.). Management of the chains in the supply chain or even departments at each individual chain is separated to strategic, tactical and operational planning level. OCM solve the management of these 3 levels of planning analytically by separation them to the disconnected parts (see **Figure 2**).

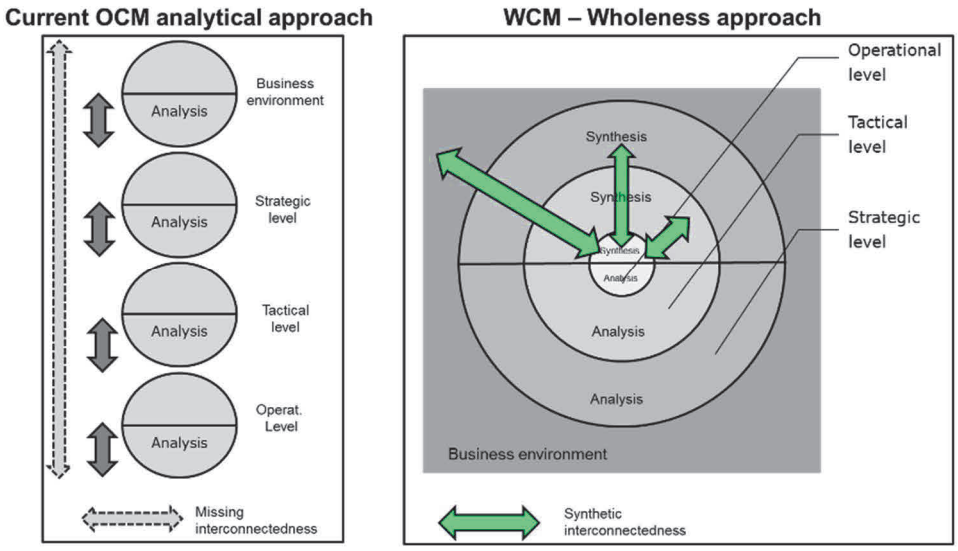

Figure 2 Interconnection of types of planning in OCM vs WCM concepts

The 3 steps of analysis take operational apart, understands the parts and put them back to understanding the whole. All the operational processes for example in the warehouse are analyzed separately. At the same time, the analysis of the tactical level, doesn´t mean synthesis of the operational one. There are no systematically solved interaction between these two levels, either horizontally or vertically direction. The same attitude is made for tactical and strategical level of the logistics processes. OCM approach is missing the 50% of the wholeness. There are no systematically solved interactions between these 3 levels of management in the businesses. All the functions and processes are not connected either horizontally or vertically to other processes, so the OCM system is missing the interactions and consequences. KPI helps to manage efficiency of OCM. This efficiency refers only to its separated parts. Separated KPI´s are not able to describe the influence of improved parts either to the next processes in horizontal or vertical integration or to the KPI describing the effectiveness of the whole. See picture 2. OCM approach uses current KPI connected with particular optimization and the targets are set in percentage reduction of each department without connection to opposing goals of each department and its influence to the total costs, for example. WCM benefits from systematically solved horizontal and vertical interactions. Due to the 3 steps of synthesis, it is possible to understand the interactions and managed the superior properties of the operational, tactical and strategical system derived from the outside environment.

Assumption 2. Management of innovations in OCM status and WCM status (see **Figure 3**)

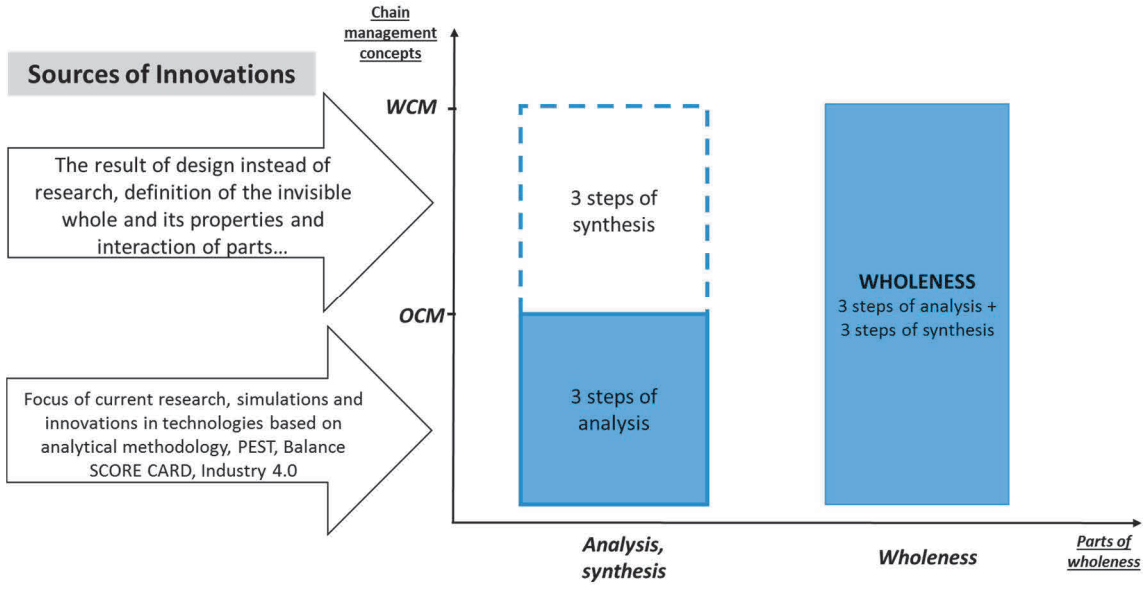

Figure 3 Sources of innovations in OCM, WCM and the parts of wholeness

OCM concepts are focused on analysis of efficiency of particular parts (departments, chains in the supply chain). Simulations, new technologies, industrial revolutions (Industry 4.0) improves the parts, the chains without understanding the properties of the whole and importance of interactions of its parts. OCM concept including 3 steps of analysis as so far missing 3 steps of synthesis, synthesizing the properties of the whole and its interactions. Any processes improved by simulations, new technology, using BSC or Industry 4.0, doesn´t systematically solved, measure and managed the interactions without understanding its influence to the other part of the department in the particular chain or chains in the management of more chains. System thinking focuses on the properties of the whole and derives the performance of the parts and its interactions. The method used to synthesize and innovate the property of the whole is not research but design. Innovation of effectiveness and efficiency at the same time is made by change of the design of the whole chain or management of chains, not by research and analysis of each individual parts.

4. CASE STUDY

Application of the new conceptual framework WCM and its two assumptions will be verified on concrete example of worldwide OEM (original equipment manufacturer) from central Europe. The daily production of 3000 cars is supported by flow of 2500 trucks a day, 100 containers and 200 wagons from its 1250 active suppliers. The range of current supply chain is defined as flow of active and passive components in logistics system including material flow, information and human resources from suppliers, forwarders, logistic´s services providers to the assembly line of the OEM.

Assumption 1 is recognized in management of current vertical and horizontal integration. Vertical integration describes operational, tactical and strategical plans and logistics departments. Horizontal integration connects suppliers, sub-departments in logistics (warehousing, transportation), production warehouses up to assembly line. Current combination of OCM is described by analytical attitude. Each department has its own goal and KPI´s without connection to vertical and horizontal consequences. Improving efficiency expressed by the logistics costs or CO2 emissions is done with the focus of maximum improvement of each individual component of OCM. The results without consequences caused that the most effort of current management to improve is focused on processes with less than 10% of the total logistics costs or 5% of total CO2 emissions. WCM with its analytical and synthetic attitudes systematically defines total logistics costs and CO2 emissions on the operational, tactical and strategical level. Due to the synthetic approach in the each level of horizontal and vertical integration all the management decisions could be focused on 100% of total logistics costs and CO2 emissions. The potential results of improvement in the whole chain management and not only in particular parts without interactions is significant: 10x or 20x higher.

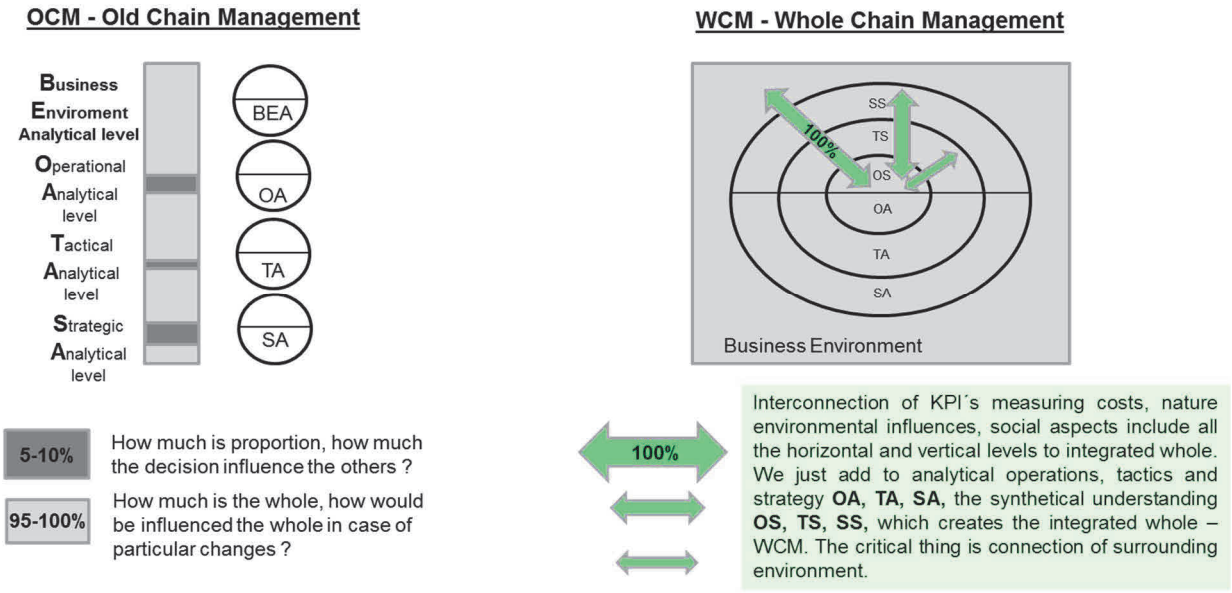

Figure 4 Ability to interact in KPI´s measuring OCM vs WCM concepts

Figure 4 describes the week points of current analytical attitude. It is impossible to answer the important management questions like: What is the proportion of internal logistics cost (including warehousing, internal manipulation etc.) and external costs? How they influence the whole? The new concept, WCM due to the synthetic attitude focusing on interactions is able efficiently and effectively combine the previous excellent analytical results with the new understanding of the wholeness.

Assumption 2 describes the role of innovation in analytical attitude connected with OCM or WCM concepts. Particular innovations are currently focused on technological innovations influencing cost reduction,

ergonomics and CO2 emissions (last SCM concept Sustainable SCM) in production, warehouses and internal transportation in the assembly plant. All these processes are improved by simulations, automated technologies, Industry 4.0 etc. The problem is that all these innovations are not accepted after evaluation of influences not only to its particular performance but the horizontal and vertical interactions influencing the efficiency and effectiveness of the WCM as well**.** The second thing is, they are made to do things faster, quicker without man power help (bigger trucks, faster truck, automation in warehouses and assembly line supported by simulation, big data, internet of things, cyber-physical system, etc.) without understanding how it influences surrounding environment around, all the departments and chains in OCM. The example of opposing goals like transportation costs vs warehousing costs made by analysis results to improvement of warehouse processes, improvement of transportations costs, but the result of the both improvements to total cost is 0. Why? The more improved transportation causes the less efficient warehousing and vice-versa. Without understanding the whole, without changing the design of the whole inbound processes following the customer (currently defined as assembly line) satisfaction. These particular improvements are still focusing on doing things right, however without understanding doing the right things. The property of the superior system is hidden outside the researched system. One of the system solution, which respects the wholeness are milk-run deliveries improving efficiency and effectiveness dramatically. However, it is utilized to organize inbound logistics processes in described central European automotive producer in less then 0.1 % cases of the all inbound deliveries. In comparison, Toyota Motor Corporation which is understand as system managed organization uses Milk Run deliveries in most than 50 % of all inbound deliveries in to its assembly plants.

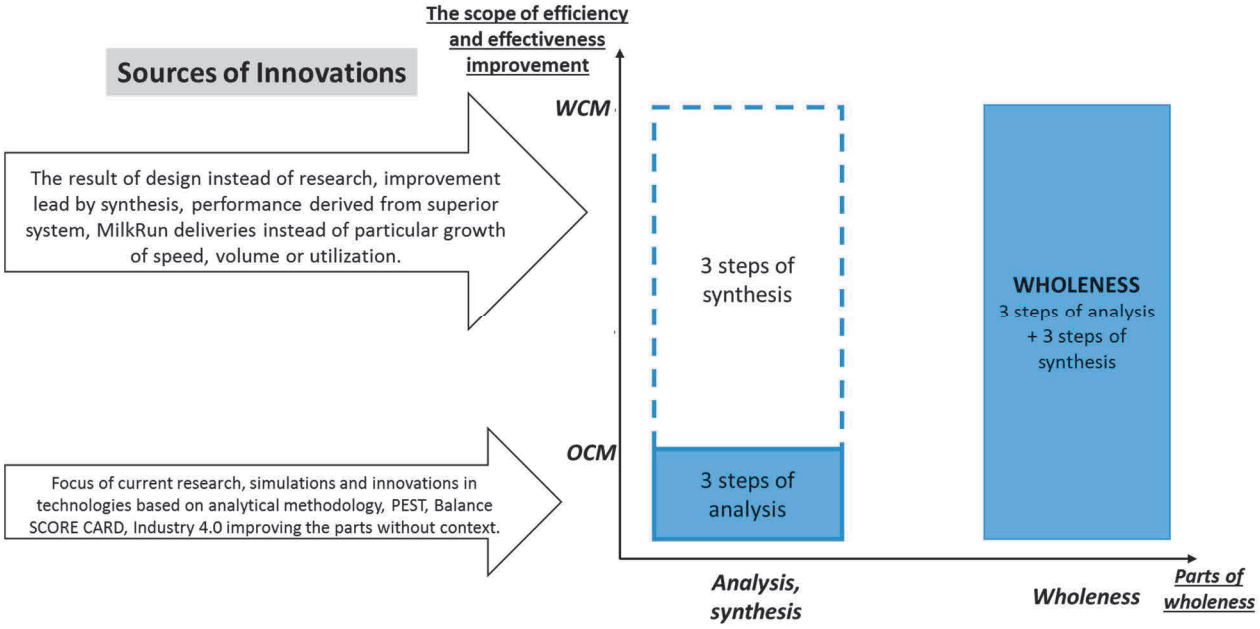

Figure 5 The scope of OCM vs WCM concepts innovations

Innovations developed by changing of the design of inbound processes doesn´t necessarily need advanced technologies improving speed, volume and accuracy. It does need to manage the consequences and interactions focusing on not only efficiency but even effectiveness in management of chains as the whole, not only particular parts. The difference between impact of OCM innovations and WCM innovations to the whole costs, CO2 emissions is significant (See **Figure 5**). The very good example describing it in detail is utilization of Value stream mapping tool to improve the total time of delivery of the complete customer order, developed by Toyota motor corporation.

5. CONCLUSION

OCM concepts intended to solve end to end supply chain system including changes in surrounding business environment. The main methodological approach is analysis of the all vertical and horizontal departments, chains in current OCM and the surrounding business environment. Analytical attitude enables to see the whole end to end supply chain only in disconnected parts (departments, chains or even business environment). Christhoper or SSCM concept have tried to apply systemic or end to end solutions influenced by outside business environment, however there hasn´t been used systematic approach, understanding the system thinking especially the properties of the wholes and its influence to the efficiency and effectiveness of parts and its interactions so far. Complete horizontal or vertical integration haven´t been systematically possible yet.

WCM concept is able to describe the whole situations in the business environment and business markets in context. It is possible either due to analyzing the performance of the parts or synthetizing the performance of the interactions and the properties of the wholes derived from the outside environment. The potential of the analysis was exhausted and thanks to system thinking there is the new source of competitive advantage connecting efficiency and effectiveness together which improves customer satisfaction significantly. 2 assumptions of WCM were described on the example of worldwide automotive producer from the central Europe. The holistic approach, well known as the big picture attitude, is used to overcome day to day routines and operational fire-fighting currently protecting to improve not only efficiency but even effectiveness in managing of chains significantly.

Any manager of any company, department or whole chain would appreciate to have systematic KPI enabling him to measure not only the performance of the parts but its interactions creating the whole with other departments, chains or even the changing business environment. Measuring and managing innovations in management of chains with context of the whole costs, emissions and social aspects is significant competitive advantage in current demanding worldwide business environment.

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