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The systems approach perspective on leagility

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Abstract:

A turbulent environment and very limited ability to make accurate forecasts triggers the need for building highly responsive organizations. What is more, there is much pressure exerted on the costs' reduction as one of the aftermaths of the crisis 2008+. The main goal of the article is to make a contribution to the stream of research devoted to creating capabilities needed for being lean and agile as response to contemporary challenges. The design of this research is based on in-depth literature review. The system approach was deployed to include lean and agile, both concepts and practices, under one consistent model. The detailed problem under discussion was meeting logistics requirements of customers. The Ashby Law suggests having differentiated responses to turbulent environment than only lean and agile. This also affects meeting requirements of customers in the supply chain. The originality of this work lies in showing the implications of identifying logistics requirements of customers for contributing to full flexibility within the system under discussion. The consequences of the Ashby Law for reactive and proactive behaviours of agents within the system should be further discussed in future research.

Keywords: agility; complexity; lean organization; system approach
JEL codes: M19, D23, L22

Reality is made up of circles but we see straight lines.
Peter Senge

1. INTRODUCTION

The strategies of combating the crisis 2008+ was based on the series of quantitative easing efforts as a result of which the global economy didn't suffer from a steep decline, however, the growth slowed down. Consequently, there is much pressure exerted on seeking efficiency through costs' reduction. We have also been witnessing the progress of the Industry 4.0 called even the fourth industrial revolution that consists of a bundle of technologies including internet of things, cloud computing, augmented reality, humanoid robots. Simultaneously, demographic changes with the growing number of both single and double incomes with no kids households in

line with the raising number of consumers benefiting from e-commerce convenience translate into new demand patterns. The consumers are increasingly sensitive and determined to obtaining a product meeting their individual needs. This, in turn, has been exerting pressure on extension of brand range and the choice on the retailers' stores shelves with new product developments. The latter is also combined with getting shorter shelf time of products. The trend towards products customization is reflected by growing a number of components and relations to cover within a supply chain.

The business environment is turbulent and it is sometimes called volatile, uncertain, complex, ambiguous. Growing complexity means the emergence of problem areas within which cause-effect relationships are subtle, and where the consequences of actions are not obvious within various timeframes. Taking this into consideration, forecasts cannot be more accurate and any predicted optimization point will be of a temporary status.

Having all above points in mind, we state that there is a need to be both lean and agile at the same time. Higher responsiveness is a driver of agile solutions, whereas pressure on costs reduction is a trigger of leanness. Agility is the key factor that gives an advantage for winners over losers in a complex, uncertain, ambiguous, volatile environment. Consequently, successful organizations should focus on building capabilities that support not only leanness but are also agile.

The demand-driven supply chain plays an increasing role in winning a competitive advantage by securing higher responsiveness. What is more, it should be also not cost intensive. As a result, the necessary capability of winning organizations is meeting customers' requirements within whole supply chain including customers' logistics requirements.

2. LITERATURE REVIEW

Agility is a business-wide capability that embraces organizational structures, information systems, logistics processes, and, in particular, mindsets. A key characteristic of an agile organization is flexibility. Indeed, the origins of agility as a business concept lies in flexible manufacturing systems (Christopher, 2000). However, agility should not be confused with leanness. Lean is about doing more with less. The term is often used in connection with lean manufacturing. Paradoxically, many companies that have adopted lean manufacturing as a business practice are anything but agile in their supply chain. (Christopher, 2000).

While leanness may be an element of agility in certain circumstances, by itself it will not enable the organization to meet the precise requirements of the customer more rapidly. Webster's Dictionary makes the distinction clearly when it defines lean as "containing little fat," whereas agile is defined as "nimble." One of the biggest barriers to agility is the way that complexity tends to increase as companies grow and extend their marketing and logistics reach. Often, this complexity comes

through product, brand proliferation, logistics including transportation, warehousing and customer service, but it also can come through the organizational structures and management processes that have grown up over time (Christopher, 2000).

The simultaneous work of lean and agile principles can support the effective and efficient management (Olhager, 2003; Narasimhan, Swink & Kim, 2006) and relationships within a supply chain (Wikner & Tang, 2008), balancing efficiency and responsiveness (Olhager, Selldin & Wikner, 2006). Researchers have addressed differently the links between agility and leanness. Agility was defined as a 'post-lean paradigm' (Jain, Benyoucef & Deshmukh, 2008), which incorporates lean principles to cope with a turbulent environment. In some other studies, we can find an approach which highlights the difference between agility and leanness (Goldsby, Griffis & Roath, 2006) where leanness is a philosophy essentially focused on eliminating all waste including time, while agility is a way to use market knowledge to exploit profitable opportunities in a volatile marketplace. Agility could be seen as an effect of entrepreneurial orientation (Żur, 2013).

The existing literature allows us to assume that the co-existence of lean agile models is needed to adapt in the complex environment. The main goal of the article is to make a contribution to build capabilities needed for being lean and agile by including logistics requirements of customers.

3. METHODOLOGY

The co-existing of lean and agile practices and concepts triggers building models that could link both approaches with each other. Some authors suggest to deploy the segmentation approach. For example, the implications of segmentation concept for supply chain management are raised by Gattorna (2009, 2010). If customer groups exist with differing service requirements, then it makes sense to optimally match requirements through some form of differentiated supply chain strategy (Gattorna & Walters, 1996; Godsell & Harrison, 2002), so that the customers' requirements are triggers of supply chain segmentation. However, the segmentation idea is based on isolated approaching of the selected group of customers which could result in suboptimized solutions. In order to avoid suboptimizational pitfalls, we argue to deploy the system approach. General system theory, cybernetics, dynamic systems, non-linear dynamics theory, systems methodology are the components of the system approach (Schwaninger, 2006; François, 1999; Laszlo & Krippner, 1998). The history of system approach could be interpreted in terms of efforts towards solving complex problems (Wycislak, 2013). Having all these assumptions in mind, we follow the methodology based on the system approach, which is presented on Figure 1.

The last of the distinguished stages reflects the link between microscopic and macroscopic levels. From the system approach point of view, this manifests itself by a topic of translating the change in behaviour of agents (eg. employees) into a patterns widespreading within a whole system (macroscopic level).

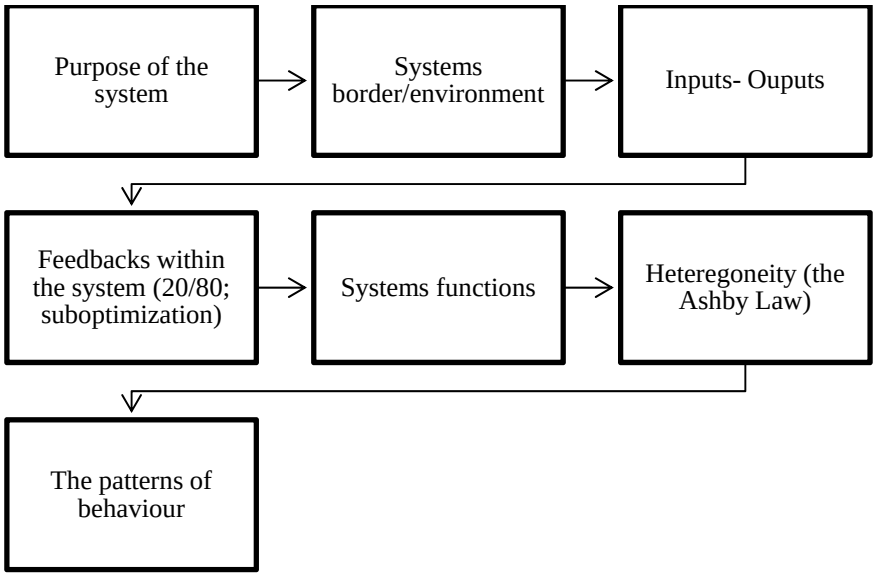

Figure 1. The methodology of the research
Source: own elaboration.

4. ANALYSIS

Purpose of the complex logistics adaptive system is meeting logistics requirements of customers. Consequently, we assume a set of activities dedicated to meeting logistics requirements of customers as a complex system. The next stage of the procedure must be done to identify the boundaries of the system. Taking into consideration the cooperation within the supply chain the boundaries between system and its boundaries are ambiguous and inconclusive. Moreover, assuming that the objectives of the company should be oriented towards the outside, the scope of an external impact the company is extended. The constituting of boundaries means creating a difference in the sense that internal relations are less complicated than the external ones .

In terms of inputs, in regard to logistics system, we assume that a way of thinking of customers is based on the two main criteria: space and time. As a result, respectively, the ratio of SKU/m^2 and shelf life trigger the logistics requirements of customers. The shelf time translates into logistics requirements of customers in terms of lead time, delivery frequency, on-time delivery, order placement, SKU preparation, logistics labelling, delivery quality (Christopher, 2011). The ratio of SKU/m^2 affects order size, pallet heights, picking ratio, deploying of sandwich pallets (Christopher, 2011). In terms of outputs – meeting of logistics requirements of customers is measured by Customer Case Fill On Time (El Sayed, 2013).

The feedbacks within a system are reflected by suboptimization principle, and manifests itself by sales peaks. The latter is a result of certain patterns in behaviour of the sales staff due to the pressure on meeting monthly targets. As customers are aware of the latter, they wait for the months endings in order to get the highest possible discounts. As a result, customer service needs to secure resources for additional work on entry and validation of orders. Consequences are twofold: higher costs and increase in the number of errors. Logistics also need to secure additional transportation capacities from the spot market, which translates into higher costs. Transport Service Providers even run of capacities and are not able to ensure the proper service levels. What is more, the trucks are not fully loaded which means waste. The additional warehousing capacities should be secured, which translates into more resources to commit. As the additional temporary resources are primarily secured by employment agency, new employees are not skilled enough, and the training is time consuming. Consequently, productivity is on the downward spiral, and costs witnessing the growth.

The principle of 20/80 implies that we should focus on 20% of customers generating 80% of turnover. In this sense, it is reasonably to differentiate services towards customers. The latter is also strictly connected with the Ashby law which is reflected by the quotation:

$$V_r \geq V_d - V_o$$

V_r – variety of potential responses;
V_d – variety of problems;
V_o – variety of outcomes tolerable by the essential variables.

Consequently the variety of logistics services both predicted and existing ones should be higher than variety of logistics requirement of customer. In other words, to predict logistics requirements of customers and to be prepared to what customers would want, and proactively manage over the customers' expectations.

The Ashby law called also the law of requisite variety reflects the conditions of ensuring business continuity through setting up full flexibility.

However, our own business practice observations of the implications of the Ashby law on the differentiation of the logistics services enables us to distinguish four options: lean, standard, agile, super agile solutions. For example, for lead time we can differentiate four options: lean – 48 hours, standard – 24 hours, agile – 12 hours, super agile – 6 hours; respectively for picking it is full pallet – lean; layer – standard; cartoon – agile; single item – super agile.

Qualitative and quantitative ranges of logistics requirements of customers – the scope of variety – are affected by the following factors:

- the negotiation power in the supply chain;
- stock management;
- geography.

The control over suppliers is a criterion behind the logistics requirements of customers. This is an effect of customers' position strength within the supply chain.

For example, if discounters cover the prevailing part of retail sales, they force suppliers to follow very short lead times, high delivery frequency (including delivery during weekends), high number of urgent orders, and very short delivery time slots or even delivery on –time.

The stock management strategy deployed by customers affects their logistic requirements. For example, some drugstore chains dispose about very advanced logistics solutions. Therefore, their orders are large and of high homogeneity. As the ratio of SKU/m^2 is high for drugstores (accounting for about 35-40), they repack products from pallets of high homogeneity to dedicated boxes (cages) in their own warehouses. This also means that drugstores chains tend to keep stocks in the warehouses for the period of several days. In adverse, discounters follow the strategy of minimizing inventory *days*. This means that the ratio of days on hand accounts for one, or two days.

Finally, geography and as a result travelled distances, terrain as well as climate conditions impact the exact numbers staying behind the logistics requirements of customers. The differentiated service offerings should include existing and a forward-looking catalogue of services. In these terms, it should be the response towards the growing variety of logistics customers' requirements. The first link between logistics requirements of customers and systems' response is the way how customers make orders, and how it translates into logistics complexity and logistics costs. In an ideal situation, it should be a perfect order. The latter is achieved when the customer's service requirements are met in full. Order fragmentation is the consequence of growing logistics requirements of customers, and is one of the indicators of logistics complexity within a supply chain. The order fragmentation is reflected by ratios as follow: orders invoiced per month, stock keeping units/order. The number of orders invoiced per month translates into a need for higher number of trucks and operational workloads including transport planning, consolidation of loads, handling in and handling out.

SKUs/order ratio mirrors orders' homogeneity. Various packaging sizes, material packaging types and temperatures result in higher logistics complexity levels. The modes of deliveries encompass central stock (distribution centre of customers), direct customers' shop deliveries, and customers' cross dock. Delivering directly to shops means higher complexity levels comparing to delivering to the distribution centre of customers. In business practice, the dedicated promotional actions are supported by direct delivery to customers' shops. Temperature levels also impact the model of delivery. The temperature regimes include ambient, chilled, and frozen modes. If deliveries follow various temperature regimes, it means high logistics complexity. This is because of different requirements for trucks, depots, and modes of deliveries.

The second link between logistics requirements of customers and system response is the level of customers' requirements fulfilment. Delivery time, order management, delivery quality are the crucial components of customers service required. Lead time, delivery frequency, on-time delivery translate into delivery time parameter within the logistics service level required. Whilst including pallet

heights, pallet weight, mixed pallets, sandwich pallets, logistics labelling, order placement, and SKU preparation stay behind the second parameter – order management, and delivery quality is measured by the ratio of claims/delivery notes.

There is a trade-off between logistics complexity and logistics trade terms. Logistics trade terms are a sum paid to customers for homogeneity of orders and order size. General rule is as follow: the higher logistics trade terms, the lower logistics complexity, and lower direct logistics costs. Logistics trade terms are a part of trade terms.

Taking into consideration – logistics complexity, logistics costs and logistics trade terms on the microscopic level, we can distinguish four patterns of behaviour on the macroscopic level. In the first step, we observe the quick wins that are results of high potential of costs savings. This reflects the lean approach. However, after exploiting low hanging fruits, the meeting of logistics of customers is achieved either by higher complexity or higher logistics trade terms. Complex sophistication should involve lean, agile, super agile and standard approaches. However, the pressure on costs reduction results in the discontinuity changes like setting up logistics centralized control tower. This new emerging order means new possibilities for quick wins, however (Figure 2).

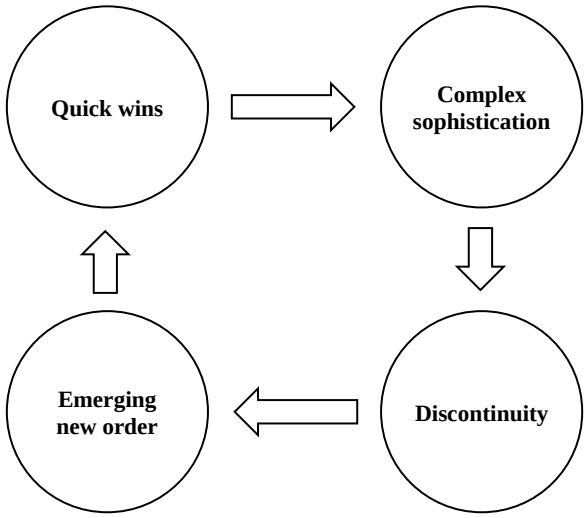

Figure 2. Patterns of behaviour in the complex adaptive logistics system
Source: own elaboration.

5. DISCUSSION

Both Christopher (2011) and Gattorna (2015) don't deploy the system approach to resolve the problem of being lean and agile. What they suggest is the segmentation of customers based on selected criteria. What is more, Christopher and Gattorna don't include the logistics costs and logistics complexity versus logistics trade terms by covering lean and agile solutions.

Krupski (2008) suggests existing different levels of flexibility, and points out agility as one of the potential components of defining flexibility. Flexibility is also strictly and directly connected with customers driven supply chains. As customers gained influence, and the balance of power in the supply chain began to shift their way, suppliers struggled to provide the desired extra flexibility demanded by customers (Gattorna, 2015). The application of the system theory points out the importance of the Ashby Law. As a result, the difference between being both lean and agile versus flexible is a result of ignoring standard and super agile solutions (Figure 3).

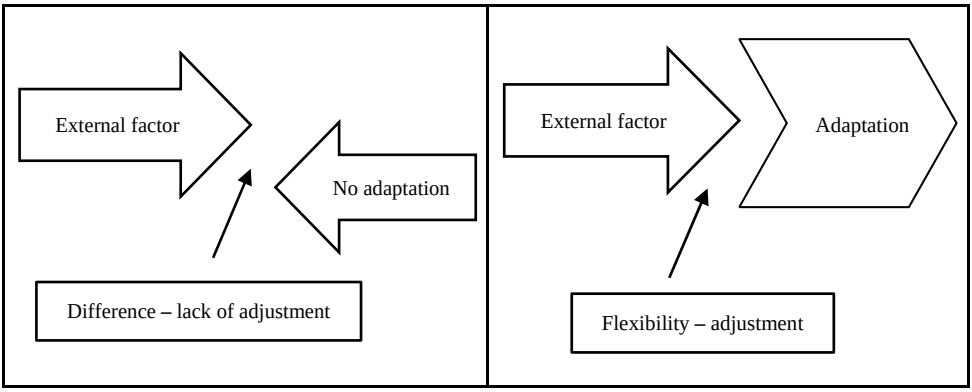

Figure 3. Flexibility including lean, standard, agile, very agile options
Source: own evaluation.

Flexibility could be perceived as reactive and proactive organization activities in terms of time, content, scope that are better tailored to the turbulent environment than existing ones. In this sense, the paper develops the approach to flexibility suggested by Krupski (2008).

6. CONCLUSIONS

The starting point of this paper suggested that co-existence of lean and agile models is needed to adapt in complex and hyper changing environments. However, in order to ensure the full flexibility for meeting logistics requirements of customers, we should have lean, standard, agile, and super agile solutions. The detailed factors affecting qualitative and quantitative ranges of logistics requirements of customers are as follow: the negotiation power in the supply chain, stock management, geography. There are two links between logistics requirements of customers and the system response, the first one – is the way how customers make orders, and how it translates into logistics complexity and logistics costs; and the second one is the level of customers' requirements fulfilment. Having in mind logistics complexity, logistics costs and logistics trade terms on the microscopic level, we can distinguish four patterns of behaviour on the macroscopic level.

Applying the system approach to solve problems of being lean and agile by including logistics requirements of customers we considered the implications of the Ashby law. This paves the way to develop the concept of full flexibility in meeting logistics requirements of customers by including logistics complexity, logistics costs, logistics trade terms on the microscopic level and four pattern of behaviour on the macroscopic level.

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