POSSIBLE APPLICATION OF QUALITY HOUSE IN INDUSTRIAL SUPPLY CHAIN RESILIENCE ASSESSMENT

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Abstract
Highly efficient supply chain becomes to be essential presumption for smooth operation of the production in each industry and also for delivering of the products produced by industry operations to the customers. The stability of the supply chain relates on its resilience. Improvement of this crucial attribute of LSC by effective way can be achieved by assessment of the supply chain resilience. QFD is known as a method to transform user demands into design quality, to deploy the functions forming quality, and to deploy methods for achieving the design quality into subsystems and component parts, and ultimately to specific elements of the manufacturing process. In the paper I would like to be concerned on use of QFD modification in the process of the supply chain resilience assessment.

Keywords: Supply chain, Resilience, QFD, Quality Function Deployment, Quality House, Agility, Risk Assessment, Logistics, Industrial

1. INTRODUCTION

The nowadays world is much faster, changing and confusing. There is a lot of uncertainty and unexpected treats around us. Logistics operation is a mirror picture of the world.

Logistics is also an indivisible part of mostly every business focused on production and consumption by consumers.

Every activity that a supply chain conducts has inherent risk that an unexpected disruption can occur. The global reach of supply chains, shorter product life cycles, and increasing customer requirements have made businesses aware that supply chain disruptions can cause undesirable operational and financial impact. [1]

Furthermore, traditional risk management techniques are lacking in their ability to access the complexities of supply chains, evaluate the intricate interdependencies of threats, and prepare an enterprise for the unknowns of the future. [2] Becoming aware of these gaps, many of supply chain researchers are beginning to understand the value of the concept of resilience, defined as “the capacity for an enterprise to survive, adapt and grow in the face of turbulent change”. [3]

Among factors increasing risk frequency and degree within supply chain we may count globalization, outsourcing, lean processes, centralization of distribution, IT dependence, product and service complexity, deficit (and overload) of/by information, continual and rapid technology innovation. [4], [3]

Although there was done plenty of work on the academic field the practice requires user friendly and easy to use tools which could assist to supply chain management in implementation the risk assessment and actions plans through effective and efficient way.

Utilization of methods known from another management disciplines (e.g. quality planning) can be good way how to pro link theory with practice. The QFD / Quality House / Quality Function Deployment belongs to them.

The text describes how this method (after some modification) could be used for the purposes of management of supply chain resilience.
2. LITERATURE AND THEORETICAL REVIEW

2.1. Definitions

Logistics = Material Management + Distribution

Supply Chain = Suppliers + Logistics + Customers [5]

Supply Chain Resilience –

The ability to return to its original state or move to a new more desirable state after being disturbed. [6]

The adaptive capability of the supply chain to prepare for unexpected events, respond to disruptions, and recover from them by maintaining continuity of operations at the desired level of connectedness and control over structure and function. [1]

Agility of supply chain –

Ability of the supply chain to react very quickly but in acceptable cost to short term, unexpected and significant changes in the business environment in order to satisfy customer requirements.[7]

Creation of responsible structure and process to service customer demands in a changing marketplace. “quick in movement, nimble. [5]

For purposes of this study both of above stated definitions are suitable.

2.2. Quality function deployment

Quality Function Deployment was developed in Japan during the 1960s by Akao as a method for incorporating consumers’ demands into product development. Akao and Mazur defined QFD as a method for defining design qualities that are in keeping with customer expectations and then translating those customer expectations into design targets and critical quality assurance points that can be used throughout the production/service development phase. [7]; [8] It was firstly used at Mitsubishi’s Kobe shipyard site in 1972. Later in 1983 it was introduced to the USA and it has since spread quickly to many other countries.[9]

Basic principle of QFD is to translate customer requirements into product/service quality indicators with required value. For that the Quality House is used (see Figure 1).
In the Quality House the customer needs for product / service are put into the rows. For each of them the customer priority level is investigated and stated. This will help to set priorities to the design engineers when transforming the needs into product technical specifications. In the right side of the “house” the benchmark data for each customer requirement are put to get overview about competition position.

The technical requirements are input into the columns. For each of them in the house bottom the values of target indicators values are stated. It is important to say that the best way how to get customer’s requirements and their priorities is via focus groups where customers’ representatives are participating. The technical requirements are set on the focus groups with involvement of product specialists and design engineers. Because some technical specifications are sometimes negatively influencing each other their correlation has to be assessed in the “house” roof. It is common that the Quality House is used in more levels of new product design – first level for product / service design, second for process design and third for activities design. The use of the Quality House enables to control design development as a project by sophisticated way [7] or to provide various analyses (e.g. row and column). [13]

The QFD has been usually used for design of physical products within the industry (automotive e.g.). When using QFD for designing logistics products and services the process variability and singularity has to be beard in mind. But the use for logistic services has been described by some authors also. The use of QFD for transformation of service requirements into design of service, process and activities to ensure service quality of 3PL providers is described by Lin and Pekkarinen in their research paper. [10] Baki, Basfirinci, Cilingir and Ar are applying QFD in their case study of Turkey Cargo Company. [11] Marousek modified QFD as a tool for continual process improvement of Parcels Courier Company. [12]
3. POSSIBLE APPLICATION OF THE QUALITY HOUSE FOR SUPPLY CHAIN RESILIENCE ASSESSMENT PURPOSES

Use of Quality House for the supply chain resilience assessment requires leaving conservative approach and looking “out of the box”. The business doing requires efficiency and cost lean approach. From risk management point of view we have to be efficient to eliminate risk. If the system of resilience is robust than we are negatively influencing profitability of the supply chain providers, if it is not optimal we are putting operation under high risk (see Fig. 3).

Fig. 3 - Zone of efficient resilience [3]

Pettit, Fiksel and Croxton defined set of factors for both – vulnerability and capability [3] (see Figure 4)
The companies have to reflect to most of the factors in their business/operations/risk management. From QFD methodology point of view the relation of factors (WHAT?) can be assessed against controls (HOW?) in the relation matrix. Figure 5 presents new form of the “Quality house”, where capability/vulnerability factors are linked to business/operations/risk controls. The aims are:

- To collect and complete overview of all controls.
- To determine measurable indicators for each of controls.
- To set optimal levels for those indicators with the aim to achieve required efficiency (see fig. 3).
- To get overview of level required for capacity / vulnerability factors (e.g. by benchmark with common practice).
- To get overview about finance sources involved into control of the system resilience.
4. CONCLUSION AND FURHER RESEARCH

Every industry – steel and metal making including to – needs to ensure the material inbound, outbound flows and its storage. It requires safe supply chain with minimum risk to customer, profitability and business continuity. Safe means resilient with enough volume of agility.

Business practice requires simply and user-friendly methods. The management main objective is to ensure company profitability. Academic and scientific field objective is to prepare simply and easy to use methods for practice. The above presented approach has been at the present rough for practical use. We have an idea. The idea needs to be verified by practical case study and afterwards simplified for use by enterprise.

ACKNOWLEDGEMENTS

The work was supported by the Internal Grand Agency of ŠKODA AUTO, a.s. No. IGA/2012/3.

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