Supply Chain Quality Management: A new risk orientated quality assurance management for global supply chains to support the phase of start and ramp-up of serial production

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Abstract

The end of the 20th century and the beginning of the 21st century is characterized by "globalization" in many areas. With the political changes of the political world map in the late 20th century changed the boundaries and systems of nation-states. Also arised challenges through the remodeling of the markets and opening and liberalization of the existing markets. Most delivery structures, e.g. the supply chains in automotive industries were changed. Supply chains and supply structures have been by the concentration on only a few core competencies fragmented. The supply chains become so longer and more complex structures. As a result increases the volume of the purchased parts or components. In addition, there are many more changes and challenges for the automotive industry. The latest technologies needs to be realized in very short time. Also increase product variants and complexity of products, fastest changes in the products and many other disorders of supply chains. The existing methods of quality assurance cannot meet all new requirements and challenges. Therefore it requires modified, adapted or additional new methods for the quality assurance. Special for the specific phase of the series starts and series ramp-up we needs modified quality methods. The research project examines existing quality methods for the phase series starts and series ramp-up. Special PAPP process for the approval of new parts and the needed production processes are focused. It will be analyze the need for changes or for the need of new methods. With an empirical study the current status in the practice of manufacturing and producing companies will be asked to identify potential issues and also best practice examples of supply chain quality management. Based on this results and with look to best examples of praxis will be designed a recommendation of new methods. Emphasis will be placed on risk orientation and on prevention. It will be given a recommendation for a risk-based preventive supply chain quality management for the specific phase of starting new production processes.

Key words

Supply chain quality management, quality risk management, maturity level, SOP

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Introduction

The European economic development in 21. Century is stamped through big changes in the business sectors made or influenced by political changes and new alliances e. g. growth of European union. End of last century the fall of the border between east and west European countries was a milestone for this new period. The political transition was a new challenges for companies and trade, a process of restructuring, opening and liberalization of markets started. By lifting of stringent administrative boundary between the blocks would it be possible to start more global business. Markets were opened and offered opportunities for trade, export and import, procurement and new production sites. A new wave of globalization with expansion into new markets e. g. China, Russia, India, Brazil with a parallel new reflection on local products and features such as in local designed food started.

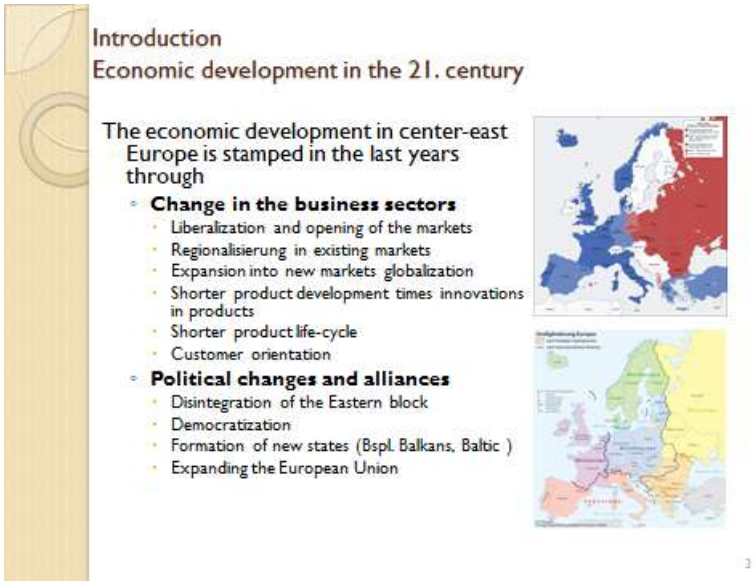

figure 1 European economic develpoment in the 21. century

The product development times of new products became shorter, a lot on new technologies and innovations e. g. world wide web and mobile communication influence other technologies and products. Today not only computer and phone are connected with internet, new products and machines e. g. televisions, refrigerators, air layers, heating systems, washing machines and multimedia systems inside of cars are today mobile networking. This products has actually a very rapid development and so most of such new products has an shorter product life-cyles and very often a higher amount of variations concerning different customer needs and different requirements of the markets. The globalization affects almost all aspects of doing business in many industries. Big and small companies transferred step by step business with export and import of production and services in new opened markets. Also the automotive industry with the needed suppliers become more and more global. Global expansion strategies follows tree steps (Kaufmann, Panhans 2006): First step of expanding normally the business growth with export: procurement is focused on central or domestic sourcing from home marked. Next will be a first localization of business and new production plants. The first business transfer marked the second step of global expansion, e.g. first local sourcing in new markets and first local production with maybe final assembly of the products started. The car industries with important suppliers localized production in new market, with semi knock down vehicles and components and first local content of procured parts. The

global integration is signed by use of global and regional markets, complete production and maybe development of complete products in the aim country, constituent components with global and regional sourcing. The details are different for each global expansion strategy, because of the different situation at each market, regulations and requirement of local government, tax and other important scale of economic.

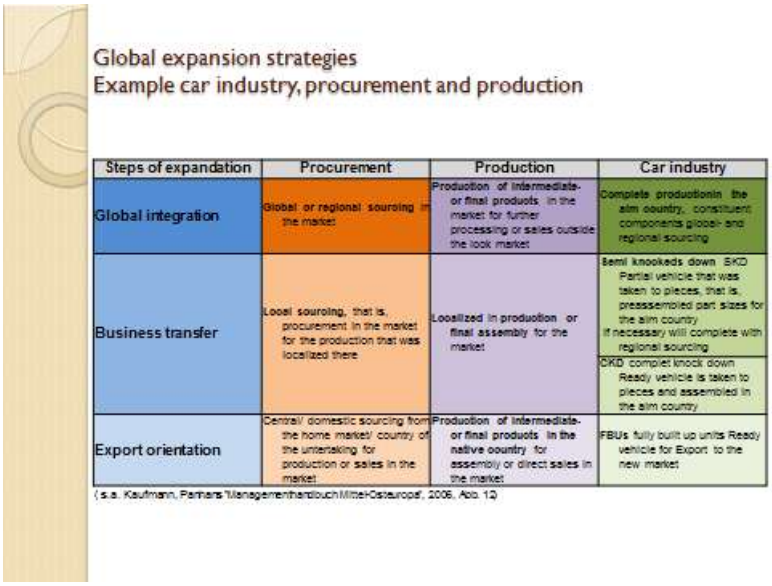

figure 2 global expansion strategies e.g. car industry

The third step of global integration will be reached with a mixture of global and local sourcing of parts and services, production of intermediate or final products in the market for further processing or sales outside of the look marked. The supply chain becomes more and more complexity, the business concentrated more on key-production processes and so the supply chain becomes more second and third supplier for the realization of the cars.

All of this business changes influences the quality management systems and daily quality work: there is a need of adaptation, development and realignments in our standards and tools. The current quality management of supply chains focused on the recruiting and sourcing, managed the nomination of new business, managed the verification and validation phase in front of the start of serial production with all needed approvals and describes a few methods how to rate current suppliers in serial production phase.

figure 3 Challenges and problems of the car industry

One of the critical phases in the serial production of cars is the phase in front of the end of production. In this phase the volume goes down, or sometimes the amount of needed parts of special variations goes up. Recourses of needed qualificated members and resources of lab and testing equipment will be switch for new business projects. If a supplier have no new business for further projects he will be not motivated to work strictly following all regulations as named in the contracting and in the based standards. All activity of the quality management of the supply chain is normally focused on actions concerning to current problems and claims, no preventive risk orientated methods or measuring systems are described unity today.

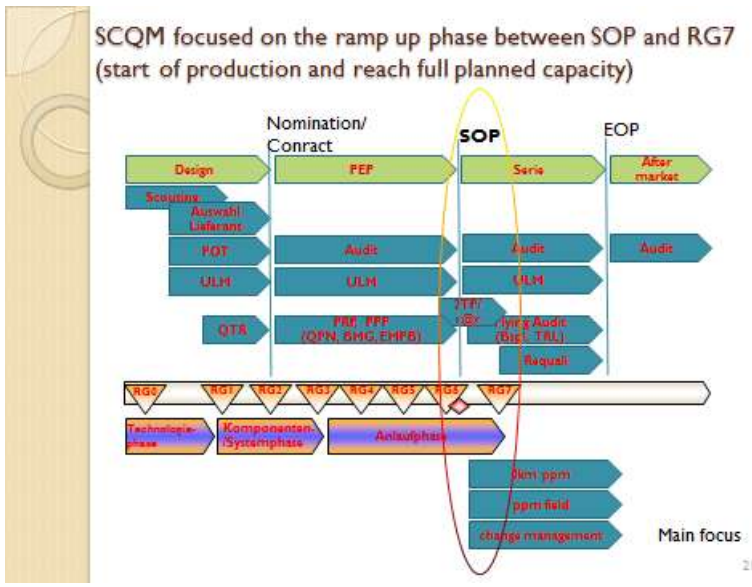

figure 4 SCQM study focused on ramp up phase

As part of a research project at the Andrássy University Budapest the subject of preventive security of supply chains through the methods and processes of quality management in the automotive industry is examined. The focus of this research examined the product life cycle with the startup

phase (ramp up) of new products. Ramp up phase is phase shortly after the start of series production (SOP) to realize the planned full capacity. The aim of the research is to develop a model for a modern risk orientated preventive supply chain quality management based on common and new quality methods. With an Internet- supported survey companies were interviewed with respect to the application of known methods of quality assurance .

SCQM in the ramp up phase

German automotive industry is a little bit different to other industries. There is normally not hard design freeze in front of production start, because a lot of components and parts have to designed in special detail in very short time. The product life cycle is shorter, new technologies have to be implemented as soon as possible, the development time became now shorter in comparison with the past. A lot of change management in front of start of production is normal to offer the newest technologies concerning current regulations of the different markets, until the latest possible date the until the last possible date the techincal requirments, needed capacity and contract terms are discussed. All requirements have to be realized and protected in den development phase internal and by the contracted suppliers and their sub-suppliers on time. A few weeks in front of presentation of the new cars final adjustments must be decided and implemented. The capacity for the production at most factories of the supply chain are built up gradually. The SOP at the supplier or at the sub-supplier is prematurely before the release and SOP of the complete car at the customer side. So a check of a full installed production process to check in front of starting serial production with all needed shifts, personal, lines, equipment's and serial checks and other needed processes and capability results would be not possible at the supplier side. From the value of a car up to 70 % as an average will be purchased with individual parts, components or assemblies. Quality insurance of supplies are very important and became more and more important because of the higher complexities of supply chains, new technologies and innovations, fragmentations of supply chains and amount of offered variations. In the last time up to 40 % of the field claims were cause by sup-suppliers (see figure 3, reference VDA). So for a new car more than thousand (1000) part have to be checked and secure its production processes with an full production and part approval process (PPAP) including all needed tests. It would be not possible for the car manufacture to check all in detail at each supplier and sub–supplier plant. So there is a need to identify high and low risk ordered supplies, to plan and to use the own resources optimally and sufficient. The German automotive association VDA create and approved quality standards at working groups of delegates experts of suppliers and car manufactures, new editions published of VDA volume 2 in 2012 PPAP and VDA standard Maturity level assurance for new parts in 2010.

Survey and first results

More than two hundred and thirty (230) participants supported the study with their detailed responses. The different questions could be answered by using pre-formulated answers, free texts to be entered or could be skipped individually. The participants are members of different worldwide companies, most from automotive industries: 8,9 % car manufactures, 82 % suppliers 1st-tier or n-tier, 9,3 % from others. Answers came from Germany (63 %), Hungary (7 %), Austria and Swiss (5 %), others (25 %). Others with 25 %: European, Ukraine, China, Mexico, Tunisian, India.

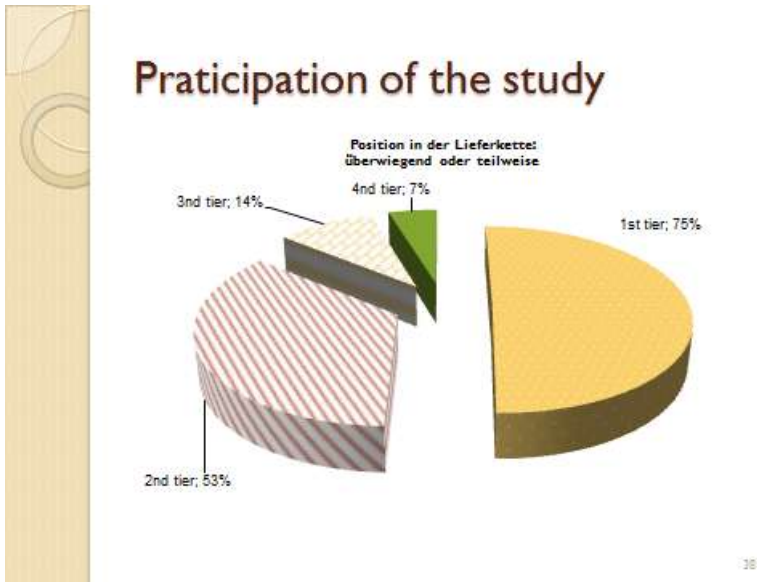

figure 5 participations of the study

To check the supply chain, there was a question about the amount of used suppliers and how many are ordered by the customer: 80 % have 50 or less suppliers, 20 % much more. Arround 40 % have to use suppliers named by their customer, mostly the group with less than fifty suppliers. The most (51 %) has less than 500 sub-suppliers and few more than 5000, but from 25 % is no information applicable about the sub-suppliers.
If we asked the participation how to monitor the supply quality, only 29,5 % have a tool with software support to check automatically and to monitor key figures or other with software support.

The following is a short overview about the many topic questions of the survey:

- For which industry produce your company products?
- How many people are working at your plant?
- In which country is your plant?
- Do you produce/work for automotive industry?
- If you are working in automotive industry, which positon do you have in the supply chain? (OEM, 1st-tier, 2nd-tier e.g.)?
- Which supplies do you produce?
- Who many parts do you produce?
- Concerning to which standards do you have a current certification of a third party association?
- How many directly delivering suppliers has your plant?
- How many suppliers are contracted/named by your customer?
- How many sub-supplier ?
- Do you have intercompany business with deliveries from other plants of your company?

- Do you use external production partners?
- Do you produce with parts which your customer deliver for use to you?
- Which methods do you use to secure the supplies?
- Which certification concerning quality standards do you request?
- How to you check the delivery quality of your suppliers?
- How do you escalate b ad delivery quality of your suppliers?
- What have been the top problems/reasons in your supply chain for bad delivery quality?
- How do you check the needed qualification of suppliers before nomination?
- How influence a bad quality rating the final nomination of new supplies?
- How do you check new suppliers if they have not yet the needed production process realized at the plant or the plant is not build? (Brownfield, Greenfield)
- How do you rate a project it there is no experience at the supplier about serial production because it is a new part/new technology/new innovation?
- Which key figures do you use to monitor supply quality?
- Which risks influenced quality of supplies?
- How many second party audits at supplier plants are realized during one year?
- How many second party audits at sub-supplier plants are realized during one year?
- Do you have an automatically software supported system to check and monitor defined key figures e.g. other information of your suppliers?

First research results are expected to present

The survey of the study runs until the end of September 2015.

Detailed questions and theses, first results with SPSS analysis and a preview on the model of a *new risk orientated quality assurance management for global supply chains* to support the phase of start and ramp-up of serial production will be presented on the conference.

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