DEVELOPMENT OF A SUSTAINABLE SUPPLY CHAIN PROCESS FOR THE PRODUCTION OF LOW-COST ROBOTICS

Use case: existing Smart Transport Robot - BMW

Mansour, Peter Sleiman A

Supervisor I: Prof. Dr. Ing. Hendro Wicaksono
Supervisor II: Karl Kattar

Jacobs University | Bremen, Germany
BMW Group | Munich, Germany

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I. Introduction

In today's world, corporate social responsibility (CSR) is one of the major topics that is defining the companies brand value. With the increase of global competition, many companies nowadays are being assessed on their CSR programs and have been trying to minimize the outcome of their business on the environment, society and global economy (Chakravarty, 2014).

Recent developments in climate change and the increase of global and climate related disasters such as flooding, extreme droughts, wildfires, cyclones and storms are begging corporate to take actions and mitigate their business impact. Therefore, in order to gain marketplace and to insure competitiveness, companies are trying to enhance their processes and create sustainable supply chains while at the same time remain profitable (Zailani, et al., 2012).

In general terms, sustainability refers to the integration of environmental, social and economic responsibility. Until recently, companies have been looking at these topics as being separate issues and have been trying to confront these problems disjointedly. In an interview with Harvard Business Review, Peter Senge, the founder of the Society for Organizational Learning, established that a company will not get very far when its focus is to "maximize return on investment capital, with an emphasis on short-term financial performance" (Prokesch, 2010). In order to focus on sustainability a company ought to take into consideration the general picture of the supply chain. Everything from supplier selection, to manufacturing processes, to distribution and finally customer and consumers should be considered while creating a sustainable supply chain process.

Sustainable supply chain processes focus mostly on environmentally friendly activities such as the adoption of eco-friendly packaging, return of end-of-life products, use of eco-friendly energy alternatives, reduced water consumption, remanufacturing and recycling. However, price and lead time competition are creating more and more pressure and making it harder for companies to adopt the concept of sustainability.

Therefore, the research question of this thesis is how to integrate the concepts of long-term economic success and sustainable supply chain management in order to create a sustainable supply chain for the production of low-cost robotics.

II. Aim of the thesis

The main objective of this thesis is to develop a sustainable supply chain process for the production of low-cost robotics in the use case of BMW's Smart Transport Robot. The outcome will be to create a supply chain methodology for such robots in Europe and to come out with potential applications of the proposed model.

The first subobjective will be to develop literature reviews on the current state of sustainable supply chains and to decide which measures are the most relevant measures when it comes to the creation of such processes.

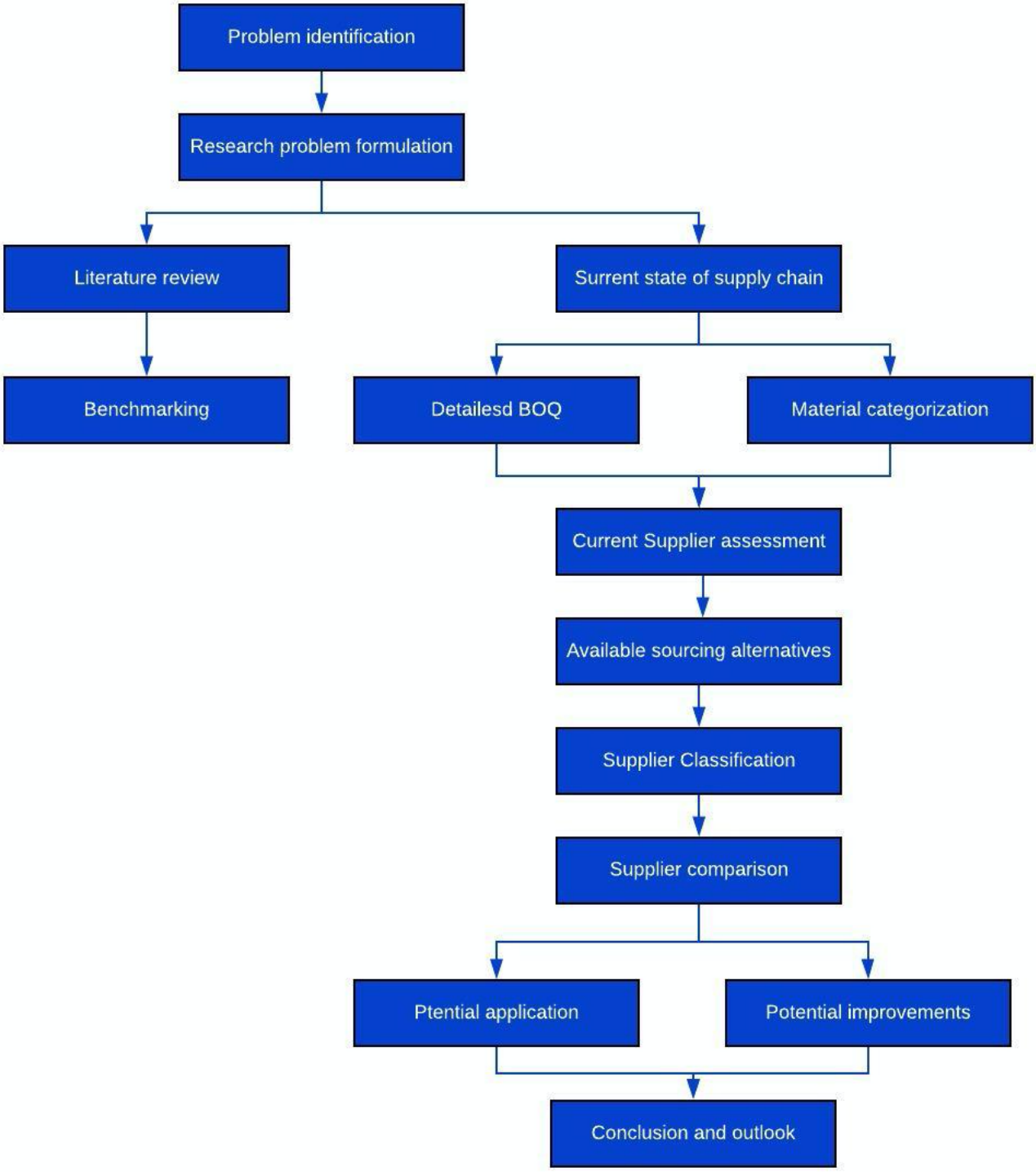
After developing the literature behind the sustainable SC, we will tackle the second subobjective. First, with the help of the available documents and by looking at the current production process of the robots, a detailed BOQ will be develop. From there the different sourcing alternatives available on the market will be analyzed. Since most of the parts are outsourced (except the batteries which are recycled BMW i3 batteries (BMW, 2019)), one of the suppliers ranking methods can be used. While developing those methods and comparing the different possible suppliers, the multiple criteria that are interesting to BMW will be taken into consideration. Such as the carbon footprint, certifications, cost, shipping time, minimum order quantities, etc.

When it comes to the third subobjective and in order to integrate the current trends in supply chain, this thesis will try to incorporate data analytics. By introducing data mining approaches, one can derive different relationships between on the one hand the suppliers and on the other the pre-qualification criteria (Rajeev, et al., 2014).

III. Thesis outline

1. Introduction
    a. Problem description
    b. Thesis aim
    c. Methodology
2. Sustainable supply chain
    a. Literature review on sustainable supply chain
    b. Current state of available supply chains (use of real-life case studies)
3. Current supply chain evaluation
    a. Development of detailed BOQ
    b. Material categorization
    c. Current supplier assessment
4. Supplier selection
    a. Available sourcing activities
    b. Data mining approaches for supplier classification
    c. Supplier comparison (using ranking methods)
5. Potential applications
    a. Develop potential scenario applications in different industries
    b. Potential improvements
6. Conclusion and outlook

IV. Course of thesis



V. Timeline

Activity	03/02/20		01/03/20		01/04/20		01/05/20		01/06/20		01/07/20		01/08/20
Preliminary research													
Research proposal													
Literature review													
Evaluation of current supply chain													
Supplier selection													
Potential applications													
Conclusion and submission													

VI. Relevant literature

BMW, 2019. *DIGITALISATION IN PRODUCTION.* [Online]
Available at: https://www.bmwgroup.com/en/innovation/company/industrie-4-0.html
[Accessed 6 February 2020].

Chakravarty, A. K., 2014. *Supply chain transformation : evolving with emerging business paradigms.* 1 ed. Heidelberg: Springer.

Prokesch, S., 2010. *The Sustainable Supply Chain.* [Online]
Available at: https://hbr.org/2010/10/the-sustainable-supply-chain
[Accessed 6 February 2020].

Rajeev, J., Singh, A. R., Yadav, H. C. & Mishra, P. K., 2014. Using data mining synergies for evaluating criteria at pre-qualification stage of supplier selection. *Journal of Intelligent Manufacturing,* 1(25), pp. 165-175.

Zailani, S., Jeyaraman, K., Vengadasan, G. & Premkumar, R., 2012. Sustainable supply chain management (SSCM) in Malaysia: A survey. *International Journal of Production Economics,* I(140), pp. 330-340.