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# Sustainability in Model-based Planning and Control of Global Value Creation Networks

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## Abstract

Manufacturing companies are affected by an increasing complexity driven thru fast changing requirements in the global market. To meet the large catalogue of requirements, enterprises are forming global value creation networks and provide services jointly. The existing time pressure and the involvement of many stakeholders results in a demand of methods and tools for a quick configuration of such networks. Beside the management of material, information and money flows the quest of a sustainable corporate development poses a further challenge for the decision makers. The consideration of sustainability in business process management is one approach to take also social, economic and environmental aspects within global value creation networks into account. Reviewing existing modelling techniques shows that the requirements for a fast configuration and an adequate management of sustainability are just insufficiently addressed or are raising the complexity further. This paper will explore capabilities of an enterprise modelling technique which supports an integrated handling of network configuration and sustainability management in a fast and efficient manner.

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## 1. Introduction

There has been a massive transformation in the framework conditions for production over the last decade. The market situation is in constant change, the pace of innovation has increased significantly. Market participants have

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to be extremely flexible and willing to develop to fulfil increased customer requirements in a global marketplace. To cope with such requirements companies are establishing value creation networks, to remain competitive and get flexible. Today the partners of such networks are more and more spread around the globe, so that they are considered as global value creation networks (GVCN) in this contribution. Furthermore, sustainability has changed from an idealistic theory to an active topic in society. Enterprises are confronted with a growing number of national and international regulations and standards regarding sustainability. A growing active consumer demand and a surcharge capability for sustainable products are observed as well [1].

These factors make it necessary e.g. to realize an efficient use and recycling of all materials through a coordinated interaction of producers, consumers and recyclers. The resulting expansion of the system boundaries leads to a further increase of relevant actors and thus to a further increase in complexity of the systems to be coordinated [2].

To meet the challenges of sustainability holistically in GVCN complex problems in the design and control of partner relations for an economic, environmental and social evaluation of products, services and value chains have to be solved.

### *1.1. Global Value Creation Networks*

In general, a value creation network can be described as a network of relationships that generates value [3]. If the perspective is broadening to the global market, they can be introduced as global value creation networks. The network actors can be suppliers, manufacturers, customers and other stakeholders.

Taking into account the development of Parolini, value creating systems, such as global value creation networks are “sets of activities that are jointly involved in the creation of value”. In his definition these activities are carried out by using a set of human, tangible and intangible resources. Furthermore, Parolini already emphasizes that companies should not only concentrate on themselves. Otherwise they are just optimizing their own work and fail to see that their problems are located somewhere else in the network. The effort for improving operation might be wasted by failing in the entire system [4].

Adapting these statements to the concept of sustainability, the importance of an efficient management of information, material and financial flows increases and requires methods and instruments for closing geographical, information, communication and compliance or implementation gaps.

### *1.2. Management Challenges of Sustainability in GVCN*

Concentrating on sustainability the above mentioned challenges need to be addressed on a company level as well as on a network level. In a first step every individual actor of GVCN must have an overview about the impact of their own products and activities to enable the evaluation of preceding and following process steps through integration [5]. Beside an agreed sustainability strategy in line with the company's philosophy this includes an adequate evaluation system, a selected pool of sustainability measures and an explicit internal communication concept. So, instruments for covering this demand should be able to connect the perspectives of strategic, tactical and operational planning and control. Scaling up this demand to GVCN many actors are involved in the planning procedure to ensure the functionality of the GVCN after implementation in its operational phase [6]. The complex cause-effect mechanisms of product, process and sustainability are often not fully known, nor can be predicted. Information flows and exchange processes have to be planned and controlled in an adequate way within a whole value creation network. The distribution of resources, objectives, stakeholders and limitations of the network must be continuously reflected and coordinated. In addition further uncertainties like growing international competition, shorter innovation cycles and an increasing competitive pressure require mechanisms to handle the increasing number of influencing factors within global value creation networks. To manage the occurring dynamic, integrated flexible mechanisms and instruments with low-effort are required to support the development of global value creation networks within all phases.

In this paper, we will explore capabilities of an integrated modelling platform for network models, which enables the stakeholders of GVCNs for collaboration and supports the planning and control from a sustainability perspective. Based on an integrated enterprise model the demand of network planning and control are depicted in a multi-perspective modelling concept [7], [8]. The presented approach is a development out of the Collaborative

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