Critical Success Factors for Sustainable Business Networks

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ABSTRACT

In order to ensure product compliance, companies need to be informed about an increasing amount of regulations worldwide and collect related material data throughout the supply chain. As return rates have proven to be low with traditional measures, new solutions need to be established. The approach of exchanging product compliance data using a network-based Information System has shown its potential with the International Material Data System (IMDS) in the automotive industry. Nevertheless, such Sustainable Business Networks (SBNs) are not used to their full extend and have not reached a high market penetration in any other industries. Therefore this research analyses the reasons for market adoption of SBNs, and extracts the critical success factors in the application area of product compliance. Finally a ranking of the success factors is established leveraging the Analytical Hierarchy Process (AHP).

Keywords (Required)

Critical Success Factors, Product Compliance, Sustainable Business Networks, Sustainability, Green IS.

INTRODUCTION

During the last decade, the awareness for safe and environmental friendly products has been growing constantly (Seuring and Müller 2008). This changed economic background has led to many opportunities for the participating organizations. Nevertheless, many companies are also challenged in numerous ways. While the aggregation of data and calculation of environmental key performance indicators as well as the substitution of hazardous materials seems to be a problem that can be solved in the near future, the collection of all required data is a challenge that needs new approaches and collective efforts of whole supply chains and industries. This issue is becoming even more severe with increasingly complex supply chains.

Environmental compliance can be considered a first step towards a sustainability strategy and sustainable innovation (Nidumolu et al. 2009). Keeping up with the hundreds of different regulations worldwide, requesting information throughout the supply chain, determining all components of a product and handing on this information to all customers in a variety of detail and format poses challenges to manufacturing companies which they are only able to meet with high efforts in time and costs. Apart from normative pressures shaping organizational responses, social, legislative (Butler 2011) and competitive (Rao and Holt 2005) factors drive the need for exchanging product related material information within the supply chain.

Social environmental awareness is an important driver for companies to extend their responsibility for products and make sure they are environmental friendly (Amacher 2004). Besides maximizing short-term profit, organizations are increasingly being held accountable for their impacts on society and environment (Schwab 2008, Tian and Sun 2010). This perception of sustainability has been coined by Elkington (1997) as the triple bottom line. It is in every organization's interest to measure its own impact in order to be able to report, react to criticism and take counteractive measures, if necessary.

More and more environmental directives have been passed during the last years, the majority in the European Union (EU). The legislation for product compliance becomes more stringent, obliging companies to report chemicals used to special governmental agencies and prohibiting the use of so-called substances of very high concern (SVHC). The situation in other parts of the world is similar. Companies can expect that in the near future, stricter regulations are to be enacted worldwide (Nawrocka 2008). A typical example is the restriction of hazardous substances in the manufacture of electronic and electrical equipment (RoHS) within the EU. Similar, but in some aspects diverging legislation is already planned or enacted in Canada, many states of the US and China. Compliance worldwide will be more complex and legislation will include a wider variety of materials and substances.

A number of studies have analyzed the connections between environmental efforts and operating efficiency in organizations, with ambiguous results (Rao and Holt 2005, Testa and Iraldo 2010, Thun and Müller 2010). This is due to the different dimensions that environmental efforts have impact on. Many organizations also become responsible for managing the entire lifecycle for their products due to the increasing "servitization" of their business model (Butler 2011). Exchanging environmental information within the supply chain enables organizations to differentiate and stand out in supplier selection

processes (Che et al. 2010), to minimize the risk of non-compliance, and to quickly react to current incidents and problems. If a quality or safety issue occurs, material and product structure information can serve as an enabler for finding out about potential reasons.

Information Technology (IT) has been previously identified as a key enabler for sustainability (Avila, 2006; Butler and McGovern, 2008). Solutions to mitigate the associated risks are platforms which connect organizations throughout the supply chain and support the exchange of sustainability data and indicators. In the sub-domain of product compliance, these platforms here referred to as SBNs help to request information from suppliers, to determine all materials for a material declaration, to pass on this information and provide lists of banned and restricted materials as well as other information on regulation. Since suppliers only have to submit their product information once and their customers can immediately access this information, environmental compliance can be realized at significantly lower cost and time. While there have been successful initiatives to establish SBNs, other attempts have failed. The reasons for market adoption have not been sufficiently studied leading us to the research question: *How can SBNs successfully be established in order to improve environmental compliance?*

RESEARCH METHODOLOGY

The research project was constructed as case study research following Yin (2003). The fundament of the research was a rigorous *literature research* as proposed by vom Brocke et al. (2009). Due to the very specific nature of SBNs, we defined three relevant areas of literature: Green IS, as the general type of application that constitutes SBNs, success factors for establishing business networks, which is the overlying concept of SBNs, and the literature on product compliance in general. For all literature streams, the search process was documented, and the amount of relevant papers successively reduced. All papers were classified in a concept matrix as suggested by Webster and Watson (2002). Due to the scope of this paper only the most relevant papers are presented here. Table 1 summarizes important facts about the literature research process. The databases were chosen based on their access to relevant journals covering the particular research area.

Research area	Search terms	Databases	Sources after reduction
Green IS	Green IS; Environmental IS	Proquest; IEEE Explore; Google Scholar	32
Success factors: Business networks	(Business network OR B2B network) AND success	Proquest; JSTOR; Google scholar	11
Product compliance	Product compliance AND (REACH OR RoHS)	Proquest; IEEE Explore; Google Scholar	22

Table 1: Literature Research Process

The literature research served as a foundation of defining the *research question*: How can SBNs successfully be established in order to improve environmental compliance? This resulted in the *study proposition* that there are a number of factors which constitute the success of a SBN. Three different types of *cases* were selected: Platform providers, OEMs, and suppliers. The overall *unit of analysis* was the solution type SBN; the main *data sources* were qualitative interviews with solution managers and product owners in the cases of platform providers and quality managers, sourcing managers or environmental compliance experts in the cases of OEMs and suppliers, additionally to documented knowledge that could be found about SBNs and their usage within the case companies, such as information send upon request via email or found via the Web and the Company Website. For each case, a within case analysis was performed and for all three types of cases three individual cases were conducted until saturation took place. Since the cross case synthesis provided the most exhaustive results it will represent the focus of this paper. In order to be able to rank the success factors, an Analytic Hierarchy Process (AHP) questionnaire was leveraged including all interview partners, and the results obtained were compared with the body of literature. Figure 1 summarizes the case study research methodology as applied in this work.

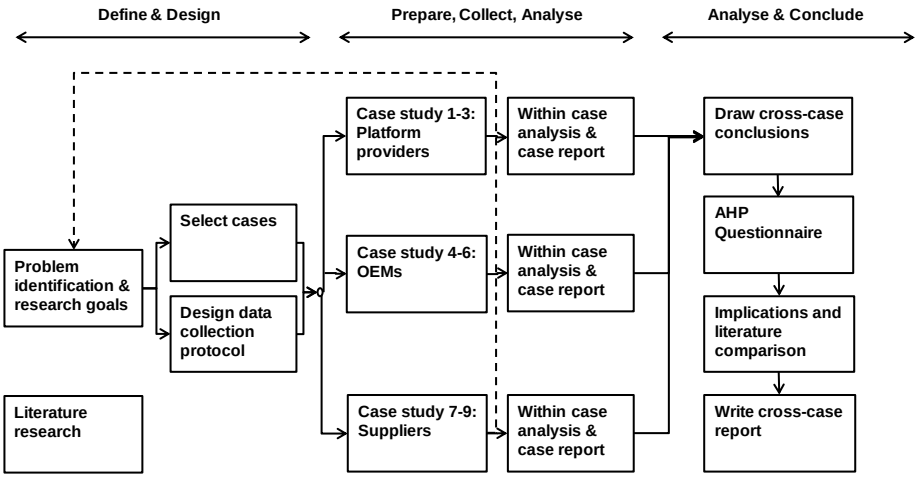

Figure 1. Case study research methodology, adapted from Yin (2003)

RELATED WORK

Green IS

Green IS refers to the use of information systems to achieve environmental objectives (Dedrick 2011). There already is a variety of literature in the field of sustainability; however a majority of it discusses environmental SCM practices, their reasons and impacts (Srivastava 2007), while there has been little research about the design and use of environmental software solutions. Melville (2010) and Watson et al. (2010) both provide a well structured literature review on the matter. Figure 2 provides an overview of the literature streams in Green IS based on Melville's Belief-Action-Outcome framework; however the concepts used by Melville were loosely translated in order to achieve a stronger focus on the construct of Information Systems.

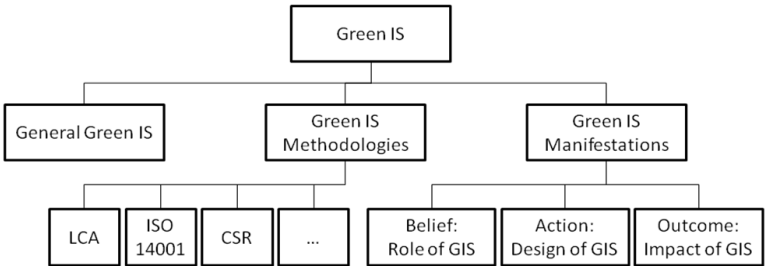

Figure 2. Classification of literature in Green IS

General Green IS papers are concerned with structuring the academic field of Green IS. Other terms coined are Environmental Information Systems (EIS) or Environmental Management Information Systems (El-Gayar and Fritz 2006). Dedrick (2011) reviews existing research in the area of Green IS and provides suggestions for further research, while he also presents a model that sets IT investments in a relationship to carbon productivity, which was defined as the relationship of economic output to greenhouse gas emissions. Fuchs (2008) in his work discussing the implications of new information and communication technologies for sustainability emphasizes that IT should be viewed both as part of the problem and part of the solution of carbon dioxide emissions.

Another stream of literature is concerned with specific methodologies that impact environmental sustainability, including Life Cycle Analysis (LCA) (Brent 2005), the ISO 14001 framework (Chan 2007), or methods and frameworks around corporate social responsibility (CSR) (Walker et al. 2007) amongst others.

Finally papers around the manifestations of Green IS discuss the role of Green IS in shaping human beliefs about the natural environment, the design of Green IS and the impact/ use of Green IS to integrate sustainability as a key indicator in business

operations. For example Heng and de Moor (2003) investigate how internet technology can be used as a new way in which to create a more equal exchange and comparison of ideas among various stakeholders in sustainability issues. Their consideration of involving different stakeholders into sustainability communication efforts fits well into the concept of a network-centric solution to exchange sustainability information proposed within this paper. Taking a different perspective, Massoud et al. (2010) have investigated managerial views of key components and performance of Green IS. Thies and Stanoevska-Slabeva (2011) propose a network-centric architecture for Green IS in order to efficiently exchange environmental indicators in the supply chain for incorporating sustainability into business processes, based on requirements extracted from literature and case studies. Patra and Pradhan (2005) propose a system for monitoring environmental indicators for the purpose of monitoring the quality of water and air in urban areas. The use of environmental systems has been studied in different context. Ijab et al. (2011) analyze how Green IS are used within organizations drawing on Bourdieu's Theory of Practice. They find that Green IS have emerged through a complex relationship between employees' and managements' 'green' dispositions and the prevalence of green culture set forward by top management via pre-defined eco-sustainability strategies. Nishitani (2011) investigates the impact of Green IS on firm performance, using data from various industries in Japan. They find that implementation increases a firm's value added through an increase in demand and improvement in productivity with better results for export-oriented companies. Several authors discuss the results of general green activities, such as green SCM, on firm performance, but report ambiguous results (Rao and Holt 2005, Testa and Iraldo 2010, Thun and Müller 2010).

Business Networks

In the context of Business-to-Business (B2B) networks, the exchange of data can be based on three types of relationships among involved parties and respective information systems:

- *One-to-one*: Companies within the supply chain communicate directly, without any arranging topology. This implies that for every connection, the communication standard as well as the content has to be defined. The automation capability as well as the degree of freedom is very high, while the costs are very high as well.
- *One-to-many*: A logical topology where one company facilitates all its business partners to communicate within a common architecture ("enterprise-centric architecture"). This simplifies communication for the company providing the infrastructure, but not necessarily for its business partners, as long as other systems are in use within the industry. Furthermore, the scalability is limited (Linthicum 2001).
- *Many-to-many*: A logical topology where all business partners use a common architecture based on a hub-and-spoke layout ("network-centric architecture"). This enables best flexibility, scalability at lowest costs, and new network enabled capabilities (Lee and Whang 2004). On the other hand the lock-in costs are very high and on-boarding/ privacy issues become prevalent.

IS for business networks, also often referred to as collaborative supply chain systems, use the exchange of information as a mean to reduce information asymmetries (McLaren, Head, and Yuan 2002) and facilitate common decisions (Erhun and Keskinocak 2011) for the benefit of the entire supply chain. The collaboration type can be distinguished by the mechanisms of the IS (adapted from Lee and Whang (2000) and McLaren et al. (2002)):

- *Information integration*: Required to remove information asymmetries within supply chains. Relevant is any data that can influence the performance of the supply chain. The information should be available real-time at low costs (Lee and Whang 2000). A popular example is point-of-sale data or inventory data.
- *Resource coordination*: The partners plan jointly and split competencies, e.g. by the means of collaborative planning, forecasting and replenishment (CPFR, (Fliedner 2003)).
- *Process integration*: The partners use common resources and integrate and streamline their processes. This can be done by the means of contracts and/or revenue sharing (Cachon and Lariviere 2005).

These IS can also be used in order to invent completely new business models (Lee and Whang 2000). Which type of collaboration is suitable for a certain situation depends on the participants, their relations and the goal(s) of the collaboration. Mentzer, Foggin, and Golicic (2000) give a summary of factors that enable supply chain collaboration. The most commonly mentioned factors are presented in the following:

1. Mutual trust is the facilitating factor for all network initiatives (Kwon and Suh 2004). This holds for every management level and functional area (Mentzer, Foggin, and Golicic 2000). Trust is a key enabler for mutual help and therefore also for collaboration.
2. Intellectual property should be respected, and private information should only be accessible by authorized users (Finch 2004), while an efficient diffusion of knowledge has to be granted (Farrell 1995).

3. Common interests/ goals are necessary in order to ensure all participants work together in every buyer-seller relationship (Dwyer, Schurr, and Oh 1987). The expectations and network roles should further be communicated clearly.
4. Value proposition for all participants means that all network members should benefit, if possible equally, from participating (Mentzer, Min, and Zacharia 2000).
5. Technology is necessary as an enabler for next generation networks. The ubiquitous internet technologies have enabled the low-cost, standardized exchange of real-time information and collaboration which can be used by the ordinary/non-technical business user (Lee and Whang 2000).

Environmental Product Compliance

The importance of addressing environmental regulation in a targeted way has been covered by a plethora of authors (Christie 2009, Geraghi 2008, Butler 2011). Some work discusses how to address regulation and mitigate the corresponding risks. E.g. Christie (2009) suggests to divide and conquer the problem by breaking it into the sub-domains content/ information, tasks/ activities and technology applications/ platforms. The paper at hand is concerned with the last sub-domain. Other authors discuss how to handle particular legislation such as REACH (Geraghi 2008) or RoHS (Goosey 2007). When addressing the product compliance legislation, organizations are confronted with two dominating issues: 1) Selecting the compliant suppliers with the best cost and quality parameters; and 2) collecting the product compliance data required by regulation (Yu et al. 2006). Suppliers on the other hand mostly react to legislation rather than having a strategy in the area of extended producer responsibility. Particularly suppliers with limited resources focus on complying with sustainability regulation (Nawrocka 2008).

As Butler (2011) states, anywhere between 65–80% of companies lack an integrated IS infrastructure to track, audit and manage issues around product compliance, even though the spreadsheet and email-based systems currently used have proven to be highly inefficient. Consequently, practitioners and researchers maintain that an enterprise-wide IS is required (Avila, 2006). This system should interface seamlessly with other organizational IS (Sammer 2005) as well as with existing processes and systems (Donelly et al. 2006). Effective sustainability efforts should become part of business processes and therefore sustainability IS should integrate with enterprise systems, such as ERP (Thies, Stanoevska-Slabeva and Dada 2012). Significant time savings of IS solutions compared to spreadsheet-based solutions are reported (Butler 2011); additionally new analysis and evaluation capabilities are facilitated. Butler further argues that IS for environmental compliance will need to support sense-making, decision making and knowledge sharing/creation in order to achieve environmental sustainability objectives.

Hu and Hsu (2010) have investigated critical success factors for implementing Green SCM practices in the Taiwanese electrical and electronics industry, in response to European sustainability legislation. Although reporting different factors than this research, their results are not contradictory to this work since they investigate the success factors for implementing Green SCM practices (macro-perspective) while the work at hand researches the success factors of many-to-many Green IS for exchanging product compliance data *when general Green SCM practices are already in place (micro-perspective).*

RESULTS

Following Yin's (2003) case study approach, the situation was analyzed from the perspective of the three main stakeholders of SBNs: platform providers, OEMs, and suppliers. Due to the nature of the research question, the focus was put on platform providers (who have a better view of the whole picture), with a total of 10 interviews. To validate the results about platform participants, 3 OEMs and 3 suppliers were additionally interviewed, all from the automotive or manufacturing sector, where environmental product legislation has had the biggest impact. In the following we will put a focus on the cross-case synthesis since it provided holistic answers to the above mentioned questions.

Status Quo

Until today, product compliance in many companies is handled by using spreadsheet and email-based solutions, which have proven to be highly inefficient (Butler 2011). A plethora of different formats and standards are in use, and these are exchanged either using enterprise-centric systems, where one organizations has established a system where all its suppliers and stakeholders can submit or access data, or the process is based on one-to-one communication channels, such as email or EDI, even though email has proven highly inefficient and the entry costs for most small and medium-sized companies are too high in the case of EDI (Iacovou et al. 1995). The standards in use include IPC1752, the most considered standard reporting format for material declaration data exchange in high-tech, the AS3595 Substance Declaration Standard in aerospace including the related Substance Declaration Form Excel spreadsheet, and the JAMP declarable substances list for Japanese

SMEs including the JAMP Material Safety Data Sheet Plus (MSDSPlus) as an information transmission sheet for information on chemical substances.

The information required for product compliance is scattered along the supply chain; it has proven almost impossible to establish business relationships with all these organizations by classical means. In fact, our interviews reported that response rates are in general as low as 5-10%. All other data has to be collected manually, e.g. by material experts and consultants, with the corresponding high costs. Duplication of work is further engraved by the fact that different companies ask for different material content: Some companies require a full product declaration, others ask for materials included in a particular substance list and finally some companies are satisfied by compliance statements.

The concept of SBNs is to provide a single access point to environmental data for the entire supply chain, and thereby avoiding the low response rates of classical one-to-one communication (Markus and Christiaanse 2003). The analysis of the platform provider use cases suggests that within SBNs, related formats are used and the content is harmonized through templates and user-driven standardization.

Success Factors for Sustainable Business Networks

During the interviews, the main characteristics that constitute a success of a SBN from the perspective of the interviewee were queried. From the interview transcriptions, a total of 15 success factors could be extracted, grouped in four categories as displayed in figure 3.

MARKET AND ENVIRONMENT	
Suitable market characteristics (type of market, allocation of market power)	What is the market type (monopoly, oligopoly, perfect market)? How is the power allocated in the supply chain (Suppliers, OEMs, retail,..)?
Focus (focus on a specific topic & industry)	How clearly the platform focuses on a specific topic (e.g. compliance) and industry (e.g. automotive) instead of being a "one fits all" solution.
Platform density (percentage of specific industry participating)	Percentage of all targeted users in an industry.
Platform size (number of participants)	Total number of participants using the platform.
BUSINESS MODEL	
Payment model (User categories and fees)	What kinds of user categories exist? What are their rights? Who has to pay, and how much?
Value proposition (valid incentives to use network for all participants)	Do all participants have a valid incentive to participate?
Marketing (mechanisms and channels to promote network)	How is the solution promoted?
PLATFORM PROPERTIES	
Technology (Stability, usability, interfaces)	How well is the platform engineered? How stable is it? How easy is it to use? What interfaces exist to existing solutions?
Content (material lists, regulations, etc.)	How comprehensive is the content on the platform (e.g. material lists, regulation updates etc.).
Standards (supporting existing standards)	How well does the platform support existing standards?
Privacy (mechanisms to ensure data privacy)	How well is ensured that privately published content cannot be accessed by unauthorized users?
PLATFORM OPERATION	
Trust (participants trust in data privacy & security)	How much trust do the participants have in the platform, regarding topics like data privacy and security?
Intellectual property (clear rules for intellectual property of platform and content)	How clear and unambiguous are the rules regarding the ownership of the intellectual property of platform and content on the platform?
Support (mechanisms and channels to support operation)	How well are the platform participants supported when having problems (e.g. technical or functional problems such as material declaration)?
On-boarding (mechanisms to support on-boarding process of OEMs and suppliers)	How are new participants convinced to participate? How well are they supported during the on-boarding process?

Figure 3. Critical Success Factors for SBNs

Market and Environment

In order to establish a successful SBN, it has to conform to a number of specifications within the frame that the market and environment offer. In a market which is dominated by few players, it is necessary to win the majority of those. In general, for every potential participant the platform gets more interesting with every company from his supply chain using the platform ("density" measure) as well as the total number of participants ("size" measure). A number of interview partners further mentioned that the platform should focus on compliance instead of offering an 'on-fits-all' supply chain solution.

Business Model

Absolutely critical for establishing a business network is a suitable business model. A specific factor mentioned during the interviews was the payment model that is what kind of system users (OEMs, suppliers, etc.) exist, what their rights and duties are, and how much they have to pay. Related to this, all participants should have clear incentives to use the platform. Not only the OEMs, but all participants should profit in total by lower costs, higher flexibility or better data quality. This should be supported by a marketing that manages to involve industry associations, companies and the public.

Platform Properties

Technology is a prerequisite for a successful business network. A stable network, easy to use and compatible with existing solutions should facilitate all potential users, e.g. (for a global network) from a big OEM in the U.S. to a small Korean SME, to use the platform without any additional investments in training or systems. The content should comprehend all fundamental regulations and material lists. In order to be compatible with existing processes, industry standards such as the IPC1752 should be supported wherever possible. Since companies are considerate about which information to share with whom, a mechanism should exist to ensure that content supposed to stay private can only be accessed by authorized users.

Platform Operation

In order to join a SBN, publish and exchange material information, trusted connections between the participating organizations, but also to the platform provider have to be established. Furthermore, clear and unambiguous rules should clarify the ownership of the intellectual property of platform and content uploaded to the platform. In order to enable all companies to use the solution without investments in training and provide their data according to platform guidelines, help in form of adequate support channels should be provided. To enable a fast adaption in the market, efficient mechanisms should exist for convincing new participants to join and support them during the on-boarding process.

Ranking of the Success Factors

After the success factors had been extracted from the expert interviews, a questionnaire was designed in order to establish a ranking of the importance of the categories and factors. The questionnaire was based on the Analytical Hierarchy Process (AHP, Saaty 1990). The experts from the first interview round were consecutively asked to rank the importance of two factors in comparison. They were first asked to compare all factors within a category and then to do the same with the general categories. This was used to establish a ranking of the categories, a ranking of the factors within a category, and finally a total ranking of all success factors. In order to so, the results were transformed to AHP matrices, then the eigenvector of the matrices was calculated and therefore the ranking established. Figure 4 displays the ranking of the critical success factors. It is not surprising that a convincing value proposition for all participants was ranked by far the most important factor, as this was a consistent scheme that appeared during the interviews.

In markets that are dominated by few organizations, these can use their market power to successively put pressure on the supply chain. In more heterogenic markets however, this is particularly on the long run a less promising approach. Also the factor ranked second, the consideration of intellectual property, was very dominant during the interviews as this was considered the main argument of suppliers not to join the platform due to fear of exposing business critical information. In particular companies from the chemical industry often consider the substances in their products confidential. As a consequence the platform has to protect this intellectual property while enabling full product compliance for the OEMs. On-boarding of suppliers is a factor that was especially emphasized by platform operators, as they experienced all the problems that can arise during this process. Other factors like content, payment model, platform size and density, privacy and focus are also mentioned in the literature about success factors of social networks (Thies and Stanoevska-Slabeva 2011), while the factors value proposition, intellectual property, trust, and technology all appear in the literature about success factors of business networks.

Rank	Success factor	Group	Rank score factor total
1.	Value proposition	Business Model	0,2757
2.	Intellectual property	Platform Operation	0,1242
3.	On-boarding	Platform Operation	0,1104
4.	Content	Platform Properties	0,0732
5.	Payment model	Business Model	0,0560
6.	Support	Platform Operation	0,0546
7.	Trust	Platform Operation	0,0431
8.	Platform size	Market and Environment	0,0421
9.	Marketing	Business Model	0,0420
10.	Privacy	Platform Properties	0,0411
11.	Platform density	Market and Environment	0,0367
12.	Focus	Market and Environment	0,0364
13.	Standards	Platform Properties	0,0301
14.	Technology	Platform Properties	0,0199
15.	Suitable market characteristics	Market and Environment	0,0145

Figure 4. Ranking of Critical Success Factors for SBNs

DISCUSSION

The consolidated findings can be used to provide a concrete set of key messages to organizations who try to establish a SBN. These suggestions demonstrate the practical value and relevance of this research, and are enlisted in the following.

Ensure a convincing value proposition for all participants: A SBN is always in danger to be an instrument of the OEMs, who stand first in line in material product regulation. In order to build a network that works well especially in heterogenic markets, the provider should make sure that all participants are better off with the system than without it.

Clear rules for intellectual property: Material data is business critical for many companies, especially in chemical and high-tech. A platform solution for material compliance should take that into account and ensure that the intellectual property of all participants is protected. The flexibility of supporting different industry-specific agreements about the exchange of substances, such as the 'Umbrella specification' for electronic parts, should be provided. In a next step the different industry solutions have to be aggregated in order to ensure compliance for all participants.

Win the champions: In order to make a solution an industry solution, it is necessary to convince those companies that dominate the market. This can provide enough incentive for their suppliers to join, and they can help with the dissemination and on-boarding. It may help to start small, e.g. to gain a high density in a specific (maybe geographical restricted) industry with high visibility, and then enlarge. Examples: US-Retail is dominated by Walmart, Tesco and Co., Apparel & Footwear by Nike, Adidas, Puma and Co. In a heterogenic market, it may help to identify and convince the key players at different stages of the supply chain.

Use a carrot and stick approach: The on-boarding was identified as one of the most important success factors for SBNs. It can help to use combinations of pull- and push approaches, such as penalties for not joining (supplier ratings, price, etc.) and rewards for joining (certified supplier program, intensified collaboration, pre-announcing order volumes, intensive support, etc.).

Build the network around the object of interest: The key interest of all participants is product information and compliance. The network should be built around this object, and all components should be checked if they support these network goals. Suitable content provides an incentive to join the network. This includes access to global up-to-date compliance legislation data including substance lists containing the relevant substances and materials, their regulatory status as well as the according critical thresholds.

Identify the pain points: It is inevitable to understand the industry needs and invent a fair payment model that represents the value for the participants.

Keep entry barrier low: In order to collect all substances used in the bill of material (BOM), it is necessary to include as many suppliers in the network as possible. Particularly small suppliers often do not have the resources installing complex information systems and/ or training of employees. The network provider should make sure it is as easy as possible to join the network. This includes multi-language support, state of the art usability and the support of current standards and systems. The costs to join should be low and on-demand especially for small companies. Trial periods help to demonstrate the business value.

SUMMARY

Within this paper the drivers and the concept of SBNs have been outlined. As part of this research, the literature in the related fields of Green IS, business networks, social networks, and product compliance has been analyzed, and a multiple case study served to identify the state of the art in exchanging product compliance related material data, the main requirements and principles of SBNs, the potential benefits and problems of such a system, and most importantly the critical success factors. The rigorous literature research, the identification of benefits and problems, as well as the ranked set of success factors for SBNs propose advancement in the theoretical state of the art, which can with some restrictions also be transferred to similar network solutions in other areas. A contribution to practice has been made by providing a practical set of key messages what to consider when introducing a SBN to the market. Of course, there are also some limitations due to the humble amount of industries considered and the low geographical dispersion, as only European and US- American companies were included in the study. Also the limited amount of questionnaires somehow constrains the results obtained. Nevertheless the potential cost savings and process enhancements of SBNs reported by the study participants give raise to the vision of supply chain networks that serve to exchange indicators not only in the area of product compliance, but all kind of indicators covering the whole area of sustainability, and beyond.

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