The 6th International Conference on Life Cycle Management in Gothenburg 2013

STATE-OF-THE-ART AND REQUIREMENTS FOR COLLECTING AND MANAGING SUSTAINABILITY DATA ALONG TODAY'S SUPPLY CHAINS

[1]Grambow, Gregor, [1]Mundbrod, Nicolas, [1]Steller, Vivian, [1]Reichert, Manfred*

[2]Schiffleitner, Andreas, [3]Bley Thomas, [3]Feick, Christian

[1]Ulm University, Germany, [2]KERP, Austria, [3]iPoint-Systems, Germany

**James-Franck-Ring, 89081 Ulm, Germany, gregor.grambow@uni-ulm.de*

Keywords: Supply Chain; Data Exchange; dynamic, process-aware data collection

ABSTRACT

Today, companies of all sizes need to gather, manage and deliver a wide range of sustainability information due to public demand, regulations and laws. However, in order to calculate reliable measurements, they face the tremendous challenge to gather heterogeneous sustainability information along their dynamic and complex supply chains. As there is no systematic support yet, the EU project SustainHub aims to develop an information system supporting complex sustainability data collection processes along supply chains. Therefore, the project's consortium has established a solid base of requirements and state of the art which are presented in this paper in a consolidated way to enrich the discussion about life cycle management.

INTRODUCTION

Nowadays, there is growing pressure on companies in the automotive and electronics industries to produce and deliver more sustainable products, coming from the customer side as well as emerging laws enforced by national and European parliaments. As a result, companies now face the challenge to gather and distribute sustainability information along their entire supply chains. Thereby, companies are often encouraged to deliver certain computed indicators based on existing regulations or laws that also consider their suppliers. The main issue in this case is the great heterogeneity of supply chain data: some data might be delivered in an unsupported format, some might not match predefined quality requirements, and some might be delivered incompletely or even not at all. So, data collection obviously combines a multitude of manual and automated tasks (e.g., data verification, validation, or authorization) and needs to be synchronized. Furthermore, in some cases, external service providers might also be included in the data collection process, e.g., providing lab tests or assessments regarding important regulations.

As sustainability data collection along supply chains is such a complex endeavor, companies crave for professional support provided by integrated information systems. However, currently available market solutions are fragmented and limited in many respects. They do not satisfy the requirements companies currently have for collecting sustainability data from their various suppliers.

The ongoing research project SustainHub[1] aims to provide a sophisticated platform that supports this scenario. This paper, in particular, deals with the dynamic process of data collection and management of sustainability data in the supply chain. It reviews the state of the art in this sector and elicits important basic requirements for implementing a system supporting automated dynamic data collection from heterogeneous sources.

BACKGROUND

This section briefly gives background information on sustainability indicators and regulations requiring them. Published by different research fields and industries, there is a myriad of possible definitions that can be considered as sustainability indicators. Furthermore, these indicators relate to different phases of the life cycle (e.g., development vs. production) and to different entities, like a produced product, a process or even a whole company. Areas of indicators may include managerial issues, like compliance with regulations, social issues like corruption and bribery, or environmental issues, like the reduction and prevention of GHG (GreenHouse Gas) emissions. There are various initiatives, regulation, and laws covering portions of these sustainability indicators formally or informally requiring companies to comply and report the indicators to customers or legislations. Examples include the ISO 14000 standard environmental factors in production, GRI[2] covering sustainability factors or regulations like REACh (REACh, 2006) and RoHS (RoHS, 2002).

METHODS

To properly elicit requirements for the coming SustainHub platform, the project consortium has taken the following approach: To gather real end-user requirements, two quantitative surveys were conducted with representatives from the electronics and the automotive industry. Furthermore, multiple companies of these sectors are part of the SustainHub consortium for continuous feedback and evaluation.

REQUIREMENTS

In this section, four concrete basic requirements of a platform supporting sustainability data exchange in a supply chain are elicited. These requirements are illustrated in Figure 1 and explained in the following. Figure 1 abstractly exposes the process of requesting a sustainability indicator from one or multiple suppliers.

Requirement 1: Request Variability. In the area of supply chain communication, a multitude of different factors can influence a request for a sustainability indicator. These include, for example, quality requirements of the requester to the indicator data (e.g., age of the data or precision of measurement) and approval processes on the answerer side (e.g., only a specific person can approve the data or the four-eyes-principle). Other data influencing a request includes specific configurations only applying for request made by the requester, properties of the situation (e.g., a newly emerged regulation), or properties of data the answerer has already provided as part of another request. If the meta data of that data matches

[1] SustainHub (Project No.283130) is a collaborative project within the 7th Framework Programme of the European Commission (Topic ENV.2011.3.1.9-1, Eco-innovation).
[2] Global Reporting Initiative: https://www.globalreporting.org

the request, no new data collection is needed. A platform supporting such communication needs to be aware of such meta data and to be able to utilize it for the request. Furthermore, as the large number of parameters implies many different request variants, that system has to be able to efficiently manage and apply these variants.

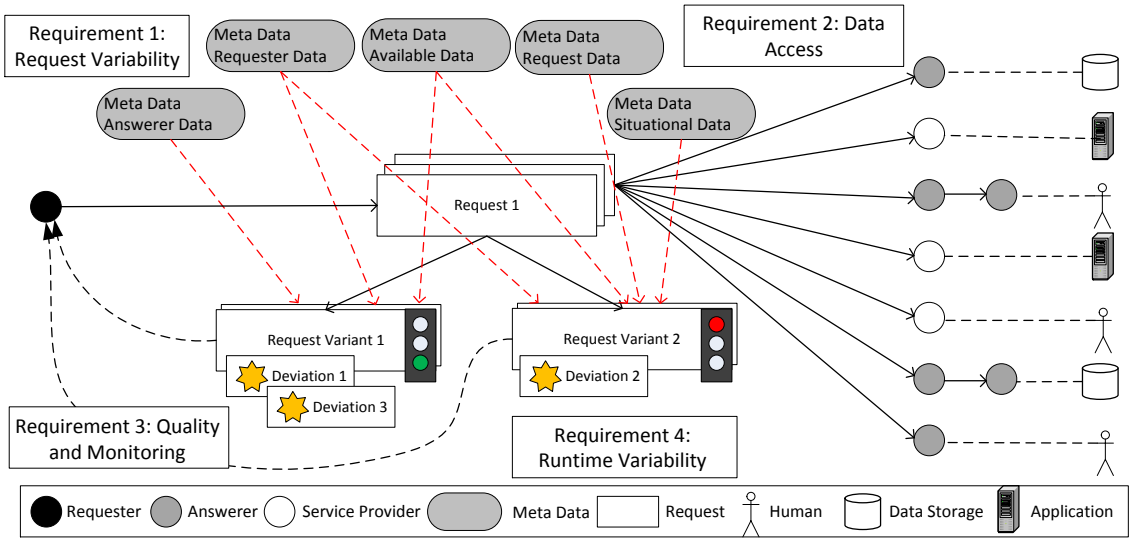

Figure 1. Data collection requirements

Requirement 2: Data Access. As mentioned before, the process of sustainability data collection involves a large number of different manual and automatic tasks. Some requests or parts of them might be answered by humans, some by automated systems. Some might be forwarded by a supplier to his suppliers. For some requests, external service providers might be involved. This implies that many different systems or data formats can be involved and that data could be provided with different calculations or units. A platform supporting such communication must be capable of managing such data as well as the access to it.

Requirement 3: Quality and Monitoring. Due to the heterogeneity in today's supply chains, the quality of data provided by suppliers might differ greatly. This can be of special importance if one request involves multiple answerers. This situation implies another problem: When expecting data from multiple answerers it is difficult for a requester to be aware of the status of his request as they might answer in different ways and with varying delay. A platform supporting such communication must be capable of coping with varying quality levels and be able to monitor request in a way that the requester always has access to up-to-date information regarding the request status.

Requirement 4: Runtime Variability. Sustainability data requests in a supply chain can take a considerable amount of time. This implies the fact that properties important for the request might change (e.g., a new regulation might emerge). Furthermore, various exceptional situations are possible: one or more suppliers might answer with data that does not match the requesters' quality requirements, might answer delayed, or might even not answer at all. Therefore, a platform supporting such communication must be able to cope with such situations and still complete the requests.

STATE OF THE ART

Due to limited space, this section presents a small selection of state-of-the-art solutions and scientific papers on this topic. When it comes to sustainability data communication in supply chains, Environ BOMcheck[3], HP IMDS[4] (International Material Data System), and HP CDX[5] (Compliance Data eXchange) can be considered as market leaders. All of these are platforms that are centrally operated by one company allowing customers to exchange material data. BOMcheck is mainly used in the electronics industry and allows for storing full material declarations. CDX supports the creation of a material management process by enabling the exchange of material data sheets along the supply chain. IMDS offers material data exchange via web interface. It solely focuses on the automotive sector where it has become the de facto industry standard. All of these systems do not meet the requirements for exchanging sustainability indicators along supply chains as they only enable the transfer of directly related product data and none about the companies, or people, or more complex computed values. On the scientific side, there are studies dealing with supply chain communication and information system support for it (Dong et al., 2009; Tseng et al., 2011). Further, there are studies dealing with sustainability reporting and the impact of information systems on it (Melville, 2010). However, these contributions focus on reviewing solutions or theoretical approaches and do not deal with the creation of new supportive information systems.

CONCLUSIONS

In this paper we have briefly shown requirements for platforms that aim at supporting the exchange of sustainability data in a supply chain. Furthermore, we have reviewed the state-of-the-art elaborating that prevalent solutions do not meet these requirements. The latter can be used to create novel systems that automate and thus support sustainable supply chain communication. This is what will be done in the further course of the SustainHub project where we aim at implementing the data collection and exchange process explicitly applying dynamic process-aware information system technology (Dadam and Reichert, 2009).

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REACh: Regulation (EC) No 1907/2006: Registration, Evaluation, Authorisation and Restriction of Chemicals

RoHS: Directive 2002/95/EC: Restriction of (the use of certain) Hazardous Substances

[3] https://www.bomcheck.net
[4] http://www.mdsystem.com
[5] http://www.cdxsystem.com