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A Data Classification to Support Collaboration in an Enterprise Network

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Abstract

To face contemporary environmental problems, we have to find every possible new way to use the available potentials of saving environmental and natural resources. The collaboration in environmental management networks is one of these ways that opens new alternatives for environmental systems. One of the main constraints to facilitate collaboration in a network is the ability to exchange information and data. However, most enterprises are not willing to give any data to other organizations in the sense that they give away corporate secrets. The purpose of this paper is to discuss how to facilitate the work of enterprise networks by developing a data classification method to solve the problem of data exchange between companies. This developed approach should help enterprises to trust collaborating with other companies, or more specifically methods that initiate interaction and support the development of trustful relationships.

1. Introduction

Trust is foundational for intercompany (B2B) cooperation and the possibility of information exchange builds the constraints for the applicability, effectiveness and synergy effects of enterprise collaboration. This latter is not ecologically worthwhile if partners in such networks are not prepared to exchange information and data. Besides new services, using instant messaging apps (like WhatsApp) increases the communication ways and the possibilities for interaction and collaboration. It is important to notice that the members of a virtual community are its real creators. Through their interactivity and participation on a community, they create additional benefits. To compare it with Google+, Facebook or any other community business approach, only the presence of active user makes it valuable for others to collaborate in such communities.

Firms are increasingly using networks and other partnering arrangements to accomplish their environmental goals in Germany[3]. Networks in the environmental management scientific domain are rare especially on the corporate environmental management information systems. The lion's share of existing research in this realm has focused on questions such as sustainable supply chains [1] and intercompany collaboration in so called eco industrial parks as part of the industrial ecology research [2]. However, the application of information system to support the creation of enterprise networks or to facilitate the work of intercompany cooperation is so far barely discussed in scientific research.

Trust building in the context of enterprise cooperation is one of the main questions to enable the processes of resource sharing, connections, communication, direction, and the work in temporary groups as specificities of collaboration. This paper presents an architecture to reduce the technical barriers for applicable environmental management collaboration.

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[3] The German federal government initiated several programs to increase the building of networks for reducing energy and material consumption, e.g. http://www.30pilot-netzwerke.de/nw-de/, neress.de

The proposed solution assumes that business networks already exist; partners know each other and work in projects before together. It is also important, that collaboration is one of the aims of the network. Strategies of building or implementing mutual trust is not part of this paper.

2. Trust Building

There are many procedures to develop trust building in enterprise networks. It is always useful to initiate connection and relationships, non-work and low-risk activities like initiating projects in small groups [3]. The communication can be separated into two aspects, the frequency and the quality of communication [4]. Frequent face-to-face interactions may lead people to better understand each other's expertise [5]. Stable and standardized roles besides clearly defined tasks are required to build swift trust [6]. Furthermore, swift trust may develop over short, intense periods of interaction in temporary groups. As social interaction and collaboration, which are necessary for collaborative environmental management, seem to be included in these trust-building processes. The main problem is to facilitate processes of connections, communication, direction, temporary groups and resource sharing at the network level. Furthermore, the processes must encourage organic growth and internal legitimacy. The importance of this approach is building a competence-based trust on both sides.

Independent of trust building, most existing enterprise networks in the German-speaking region don't use new information and communication technologies. The cooperation is still based on email, telephone and fax [7, p. 86]. Additional to the social behavioural activities of building trust, using specific technologies and be aware of the information that should be exchanged will help network partners improving the collaboration by providing own data in a network. From information systems point of view, such activities requires a data exchange by sharing data and information. It is difficult to assure companies sharing portions of their data. However, to improve intercompany cooperation's effectiveness and efficiency, data exchange is recommended.

3. Enterprise Network and Virtual Communities

This paper doesn't present the process of building enterprise network. It supposes that there are existing networks with more than two enterprises (dyad). Independent of business branch, supply chain and the relation between the partners (edge) is at least as high as the amount of enterprises (nodes) in the network (see Figure 1).

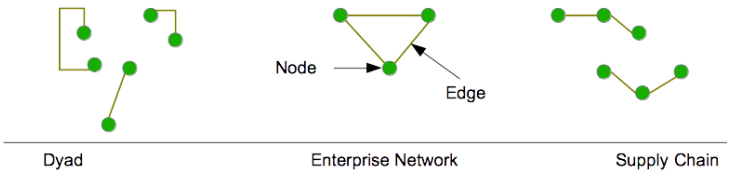

Figure 1: Different relation types of enterprises

Based on the existence of enterprise networks and their usual communication ways, a new communication level must be developed using an information system to manage the cooperation in such enterprise networks. The existing virtual communities provide a lot of experience that can help understanding and structuring the new way of cooperation between firms.

The beginning of virtual communities can be seen where scientists form interactive research communities that existed not on a physical campus but also on the Web [8, p. 4]. Today, we can separate virtual communities based on classification of Hagel und Armstrong [8]. Although, the possibilities and functionalities of communities are changed in the last 17 years, the kind of use is comparable and the communities' functionalities aren't any more clearly separated. In other words, communities may overlap.

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The types of communities existing on the Web are [8]:

- Interest: Communities of interest are built based on special fields of people interests like travel, entertainment, IT, etc. Usual characteristic of such communities help in finding solution of a specific problem or sharing knowledge of specific topics. In addition, asking a question where different people can post answers help most people to profit from these conversations as passive user where they profit from prior discussions or questions. People may want to develop their skills in learning how to export a CSV from an excel-sheet or implement a search algorithm in their Webpage. Many communities target the interest need by bringing together a group of people who share interest and expertise in a specific topic.
- Relationship: The primary value of this sort of community is its capability to bring people together independent of their location. The ability to keep in touch with schoolmates or people you met in a conference years ago is today nothing special in social networks like LinkedIn, Facebook or Google+. As referred by Hagel & Armstrong in [8, p. 19], the communities of relationships are not based only on people with similar experiences. Rather, the relationship communities with their functions help people finding partners to stay connected with them. The functionalities of communities of interest and relationship can be merged.
- Business Communities (Transaction): There are different Web applications that provide a place for commercial interactions. Web Services like eBay and Amazon changed the kind of transaction. A peer in such communities can be dealer and consumer at the same time. How products are advertised and how people buy their products is still a changing process and it is difficult to preview how it will become in the next 10 years.
- Communities of Fantasy: The Web gives people the opportunity to come together to build and explore new worlds of fantasy and entertainment. The market of such communities provides multiple platforms with different functionalities and possibilities.

Another way to distinguish the types of enterprise networks is in the long-term goal of such networks. The first type of enterprise networks is the learning type that aims at bringing companies together to learn from each other on a specific topic. A good example of such networks is the project “30 Pilotnetzwerke” [9]. The main activities of the learning networks based on the results of this project are [9, p. 9]:

1. An initial consultation for each participant by an experienced engineer;
2. An agreement development on a common target with a time horizon for energy efficiency improvement of the network;
3. Regular meetings (four times per year) with presentations on technical and organizational issues by invited senior experts and exchange of experiences among the energy managers and
4. A monitoring of the progress and improvement of energy-related developments for each company and the network.

Characteristics of such networks include that they are well organized with support of external players like the Chamber of Commerce, regional industrial platform or governmental institutions.

The second type of enterprise networks is more related to the geographical location of an enterprise. An example of these networks are industrial parks or areas in cities where many small and medium sized companies are located. The diversity of activities in such network is big so they offer traineeship in cooperation, initiate climate protection projects, organize purchasing pool and organize street festival [10], [11]. The geographical proximity and the high frequency of seeing each other’s might build a foundation to develop a new form of collaboration that doesn’t exclude data and information exchange in specific realm.

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4. Problems and Barriers

Giving the participants in a business network the possibility to interact with each other and exchange data to solve problems induces that an information system should be implemented and used in the network. However, such approach has some problems and barriers.

The barriers of an intercompany information system is similar to the barriers for an information system used in one company. In addition to the cost of buying, implementing and training, there are different problems that should be solved before and during such process:

1. Success of an intercompany information system is dependent on all partners who are part of the whole implementing process;
2. An information system in a company is always prone to changes. This will result in a more burden to the partners in sense of losing control over their work. The reluctance of change and transparency may let partners refusing the utilization of such system.

Another problem is the compatibility with the enterprises' existing information system and data structures that make the process of integrating two different information systems more complex and difficult to manage.

The presented approach in this paper aims at showing one way to overcome the aforementioned barriers. Companies will not permit any external partner to access their data because this can endanger them. It is reasonable why companies refuse software solutions where they provide data that can be accessed from external firms. Considering that every material order is an information exchange with external supplier, it is not extraordinary in business world to exchange data with external organizations. It is the question of the purpose, framework conditions and what kind of data to be exchanged. An improvement of the ways to exchange data in companies provides a possibility to handle the data exchange in business network.

The cooperation in a network should have the possibility to adapt to change. This dynamicity should be supported. A successful cooperation in a network in environmental issues presumes adopting new knowledge of environmental management and resources saving. In addition, it should take into account that companies can leave a network and a new partner can join. An information system that supports the collaboration should recognize this, especially from the data point of view. Data protection, data security and data integrity must be ensured as well.

5. Data Classification

To fulfill the known security standards, business software solution is usually required. Data safety is considered one of the most indispensable factor for companies. Furthermore, any adopted solution should give the possibility to exchange data. Apart from the developed trust between network partners, no firm allows other firm to access their data. The solution should allow the possibility of active data release if companies decide to cooperate on a specific matter. Thus, the company has all time full control over their data. The decision to provide data to another partner can every time be canceled.

Taking a holistic view of company data and their relevance, it needs more than the data on its own to become a secret or a relevant information for the company. In other words:

- Companies might publish data in yearly reports or for other reason.
- As mentioned before, companies already exchange data for different purposes. The order of materials, the use of consultant services and any interaction with suppliers or customers is in part data exchange (see Figure 2).

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- Most data in any company are not secrets. Information about cleaning a metal surface or the used amount of any specific material are in the most cases not a company secret and doesn't endanger it.
- Data without the context of their creation have in most cases a limited value as information but it can help other companies solving problems. For example, the information of replacing a hazardous material with less dangerous one helps a company without giving further information of location, amount, etc.
- Aggregated data can be less dangerous as subject of betrayal for a company. For example, to know how many energy is consumed in a process can help another company to make a conclusion about the amount of produced articles. Aggregating data of different companies doesn't allow this kind of conclusion.

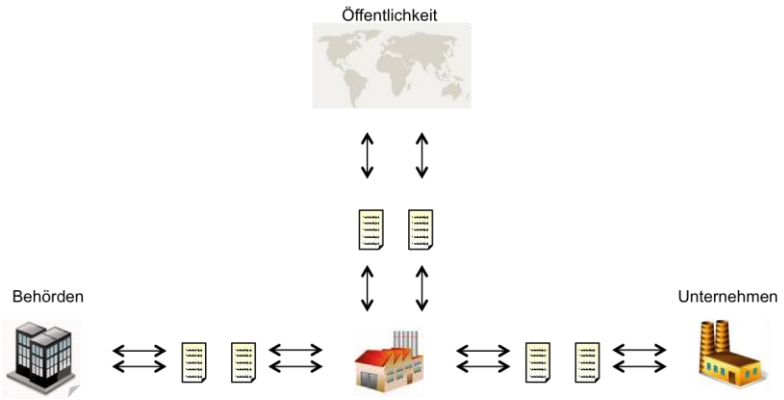

Figure 2: Companies already exchange data

Based on the five points above, five classes of data and information types can be defined:

1. Open data: Data that can be provided for all partners in a network. Published data can be clearly associated with the enterprise as a source of it.
2. Anonymous data: Data that can be searched by an algorithm to provide additional information for network partner. The prevented data doesn't show any context or relation to the data source or the company that provided this data.
3. Aggregated data: Information that is part of this class can be presented in an aggregated form with a link to the company.
4. Network data: Allows data to be aggregated in the context of the whole network.
5. Dyad data: Data can be made available for specific company or a group. This means that a company starts a project in a specific domain with other partners in the network and only those partners can access the data.

Based on this classification, a data model is developed to implement the possibility of providing data depending on the abovementioned classes.

6. Data Access Framework

An approach for a system architecture (Figure 3) that implements data components to recognize the data access is based on the aforementioned classification. Every data insert goes through the "data classifier" which adapts defined roles to classify the data. On the other hand, every data read access goes through an encryption component. The job of this encryption component is to hide the part of requested entity that shouldn't be seen by the requester based on the predefined roles.

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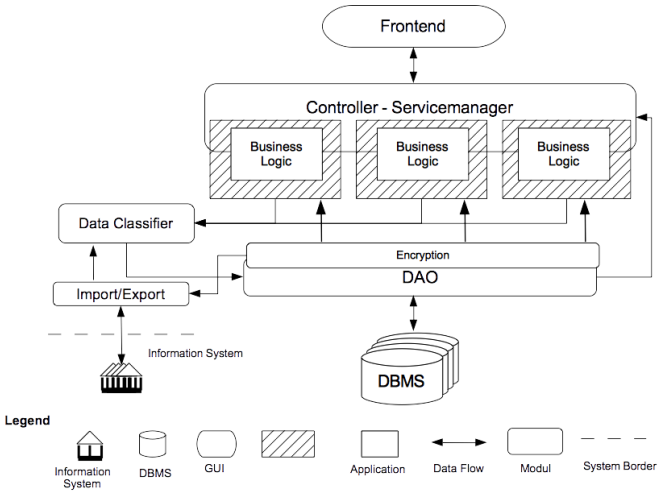

Figure 3: The Overall Architecture

Data that should be hided are encrypted to allow the business logic to apply calculations on the data. This makes it possible to use the data in the second layer but leaves it hidden from the frontend layer. This paper just introduce and doesn't give full details of the overall architecture.

7. Conclusion

Data access authorization can be granted using an information system based on the proposed classification presented in this paper. The data classification system does not only hides the information from the unauthorized users (or groups), rather it allows the access to individual services for internal calculations. A virtual community must address the needs of its members. Enterprise networks has different structures and therefore, they have different needs. An information system that meets all the needs of different networks is a hard challenge. Therefore, the aimed information system should provide basic functionalities to represent a network and communication structure that allows collaborating. This system must give the possibility to be customized for a specific network needs. The provided approach here presents one way of how data exchange in an enterprise network can be kept under control.

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