Inter-organizational Information Alignment: A Conceptual Model of Structure and Governance for Cooperations

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ABSTRACT

The increase of joint ventures and cooperations in general has transformed the classical "make or buy" into "make or cooperate". Especially the role of information is a major challenge. To unleash the potential of information-based cooperation social, professional and technical aspects have to be considered. This article presents a conceptual model for information sharing and governance between organizations to raise the effectiveness and efficiency of collaboration. The model describes the necessary structure, essential processes and needed roles for inter-organizational information alignment. It can be used as a basis for (1) the analysis of failed inter-organizational cooperation, (2) the optimization of existing cooperative enterprises and (3) the formation of new cooperations.

KEYWORDS

Information Alignment, Network Governance, Information Structure, Cooperation, Information Sharing

INTRODUCTION

The increase of joint ventures and cooperations has transformed the classical „make or buy" to „make or cooperate"(Fladnitzer, 2006) and led to a variety of types of inter-organizational cooperations. The main challenge to cooperations is the allocation, production and use of relevant information in the network as a whole and for each single participant (Madlberger and Roztocki, 2008).

Asymmetric information is one of the core challenges when analyzing information processing in cooperations. The uncertainty, dependency, fear of manipulations and loss of trust related to this aspect might lead to a bad overall performance and finally the dissolution of the cooperation without having realized possible competitive advantages. Since cooperations can be seen as a network of relations between principals and agents, conflicts and asymmetric information can occur.

The design of these mechanisms has to take account of the problem of information allocation in cooperations, because executives tend toward not using relevant information, demanding too much or irrelevant information or search for information after decisions are already made (Picot et al., 2003). To avoid these situations the information structure and information flows have to pay attention to the real demands. Picot et al. (2003) define information demand as the type, amount and quality of information a person needs in order to fulfill their tasks in a certain timeframe. In the area of cooperations this exchange of information is crucial since "the impact of inter-organizational information sharing is not merely operational; it alters and shapes competition"(Seidmann and Sundararajan, 1998).

The prominent role of information is highlighted by Hall and Saias (1980). The authors state that the overall strategy of organizations depends on information flows and information processing capabilities. They say that information cannot be adopted without distortion since existing structures for information processing only let particular information pass (Schreyoegg, 2003). This is a problem, Bergeron et al. (2004) say because „strategic change creates the need for more information and greater information gathering, interpreting, and synthesis capabilities, which in turn leads to changes in structure". So the relation of strategy, structure and information allocation is critical when organizations want to cooperate. The effective design is possible „ […] when there is a match between the information-processing requirements of their [organizations] strategy and their [organizations] information-processing capacities" (Bergeron et al., 2004).

Information technology (IT) plays a significant role for success of the information management. The massive decrease of transaction costs made new kinds of processes and new kinds of cooperation possible. The popularity of Business

Intelligence also underpins the importance of gaining control over the large quantity of data enterprises and networks produce. Through adoption of inter-organizational information systems and business processes the business value of cooperations can be realized. But the huge amounts of data which can be exchanged and processed in networks of organizations have to be governed from a strategic point of view. The relevance of IT in single organizations for achieving strategic goals is a main research area of information systems research and is mainly covered by IT governance and the aspect of business/IT alignment (Chan and Reich, 2007). The importance of transferring these approaches to networks of organizations will be underlined through this paper. But the problems mentioned above cannot be solved by only looking at the IT. A holistic approach which deals with people, data and systems is needed.

To solve the aforementioned problems we propose a model of inter-organizational information alignment and complementing governance mechanisms to build effective information structures and enable an optimal information allocation in networks of organizations.

The model describes three interlinked dimensions to build the inter-organizational information structure:

Structure: How can the appropriate structure be designed for different cooperation arrangements?

Processes: Which processes and complementing tasks have to be established?

Actors/Roles: What kinds of roles are needed and which perspectives are possible?

These three dimensions have to be constantly evaluated through performance measurements, which guide the reciprocal alignment and adaption to changes inside and outside the cooperation.

The paper follows a design science approach. Through an analysis of existing approaches the specifics of inter-organizational cooperations are drawn and taken into account in the construction of the model as the main artifact of our research. At first we present the theoretical background followed by basic approaches used in the design of the conceptual model. These approaches were chosen because of their relatedness to practice. Afterwards we present our approach in detail before we close with neighboring research topics and the conclusion.

THEORETICAL BACKGROUND

The concept of cooperations includes all types of collaboration between autonomous organizations to achieve strategic competitive advantage. Many terms are used in the literature to describe the characteristics of cooperations like value network, networked organizations (Sandkuhl, 2008), cross-organizational collaboration (Madlberger and Roztocki, 2008), virtual organization, strategic alliance (Das and Teng 2003), joint venture and many more. Furthermore cooperations can be distinguished by their direction (horizontal, lateral and vertical) and coordination mechanisms (market-based, hierarchical or hybrid forms) (Duschek, 2004), number of actors, duration of interworking and other factors. These forms are not excluding each other (Fladnitzer, 2006), so we define only two basic determinants which affect the governance profile - coordination mechanisms and direction of cooperation.

The monocentric governance profile often appears in hierarchical coordination with unipolar balance of power in the cooperation. Polycentric governance is characterized by the balance of power between multiple participants (Bach, 2003; Wollf, 2005; Zentes, 2005). The relevance of coordination for information governance will be described in next captures.

But cooperations evolve over time. This is caused by the entry or departure of participants, further development of existing participants (Martin and Behrends, 1998), the change of conditions in or outside the network (Das/Teng, 2002). These dynamics force single participants and the whole cooperation to adapt to new situations. This means that the governance structure has to be flexible enough to be changed and also enable the further development of the cooperation.

Because of the dynamic nature of cooperations with different power, decision distribution and different goals, these essential attributes of collaboration might lead to conflicts (Winkler, 2006). Consequently, a balance of goals is an important aspect of a successful cooperation.

Information and knowledge are the basis of all activities and decisions to reach strategic goals and to realize economic rents (Spender and Grant, 1996). The survey of the German Institute of Intangible Assets (DIIW, 2007) reveals that the predominant number of companies rates their information supply as insufficient. 41.9 % rate the supply as bad and 31.43 % as very bad. This situation leads to a number of problems starting with inefficient procurement, missing understanding of data and extended time-to-market of new products (Weber et al, 2009). Furthermore the subjectivity of information perception and the dependency on context knowledge affects the effective usage of information. These problems are even more relevant in cooperations, since participants demand more information from their partners than subsidiaries do (Meier and Chismar, 1994).

As a cause for insufficient information supply often the missing or misleading IT strategy and guidelines are mentioned. This impacts the communication and coordination of information and leads to an improper information strategy (Weber et al, 2009). The quality of data and information plays a major role and is decisive for the success of business networking efforts and therefore has a value in its own right (Otto et al., 2011).

Information sharing brings more problems that are mainly influenced by asymmetric information, which generally leads to instability, insecurity and inefficiency within the network. Companies want to prevent loss of intellectual property or avoid investment in needed technical infrastructure. Thus the benefits of information sharing have to be much more promising than possible loss or costs (Li et al, 2006).

Summarizing the above, the agreement of participants of the network about relevance, amount and quality of exchanged data and information as well as the technical aspects of underlying technology and data standards has to be achieved (Knop, 2009). This means that the realization of strategic goals in cooperations can be gained only through the integrated definition and implementation of strategic, organizational and technical approaches.

BASIC APPROACHES

As the basis for our conceptual model the following approaches are relevant and will be presented shortly: Network Governance Theory (Winkler, 2006), Scope of information shared (Seidmann and Sundararajan, 1998), Data Governance (Weber et al., 2009), Information Logistics (Dinter, 2008; Sandkuhl, 2008), Information Governance (Kooper et al., 2011).

Network Governance Theory

Winkler considers three elements - structures, processes and network participants – to describe the whole cooperation structure and to impact the rules to deal with goal conflicts (Winkler, 2006). Actors take a place within the network structure depending on their role and function, but if they have "the power and know-how to influence and enact a partnership agenda", they can have a major influence on the network (Huxham and Vangen, 2001). Furthermore those positions impact the decision rights and this plays an important role as a governance mechanism (Winkler, 2006).

Scope of information shared

Seidmann and Sundarajan (1998) identified four levels of information sharing between organizations. The first exchanges the information on the transaction level. The second shares select operational information in order to exploit superior expertise across organizations, and possibly to improve efficiency. The third level shares the information with strategic value to the receiver of this. At the fourth level, the information adds strategic and competitive value to receiver. Every level includes the information of the lower levels.

Data Governance

Data Governance (Weber et al., 2009) has the aim to increase the quality of data and information and establish the organizational capabilities to control the quality permanently. They define tasks to assure the data quality, identify roles to be created and assign responsibilities. They distinguish between two levels of data governance – the micro and macro layer. The first describes the organizational unit which has to carry out specific tasks to ensure the anchoring of data quality in the whole organization. The second defines the organizational framework and guidelines on how to design the micro layer, especially coordination and task allocation (Weber et al., 2009).

Information Logistics

Information Logistics is understood as the planning, controlling, execution and evaluation of cross-sectional data flows. Furthermore the adequate storage and preparation of information is a main task. Subject matter is always the supply of information to support decision making (Dinter, 2008). Sandkuhl (2007) defines Information Logistics as "optimized information provision and information flow based on demands with respect to the content, the time of delivery, the location, the presentation and the quality of information".

Information Governance

Kooper et al. (2011) define three types of actors which interact within the information transaction space. They are distinguished by their perspective in the processing of information interchange - creating, receiving and governing. Especially the governing actor as third role involved assures the optimization of the value of information from creator up to receiver and should therefore include the human interaction of actors with people, data and the underlying systems (Kooper et al, 2011).

Based on above approaches we introduce our model of inter-organizational information alignment, which aims to the effective building of the information structure and data delivery to each cooperation partner with regard to the network dynamic.

MODEL FOR INTER-ORGANIZATIONAL INFORMATION ALIGNMENT

Our starting point was the idea of Anand and Mendelson (1997) that the coordination between the organizational arrangement of the business and its information structure is the key to effective information exchange. They describe the information structure as the determinant of information and knowledge property ("who knows what") and coordination as a delegation of decision rights ("who decides what"). We understand information and knowledge as interpreted data that is systematized and integrated for a specific purpose (Setchi et al., 2010).

The information structure in our model consists of three components – structure, processes and actors/roles, which are interdependent to each other. This is an analogy to the cooperation arrangement based on network governance theory (Winkler, 2006). Structures impact processes and actor's behavior. Processes influence the forming of structures and thus, actor's roles and behavior, as well as the building of a platform for communication. Actors/roles depending on their authority, functions and decision rights impact the design of structures and processes.

The components are shaped by direction, coordination mode and status (function, authority) of the actors. If information ("who knows what") is the main source of cooperative benefits, the information structure determines the coordination arrangement. In all other cases of assets ("who has what") the cooperation arrangement is the basis of alignment. Coordination refers again to the delegation of decision rights, and the way business processes and sharing of resources is carried out. It is important to note that, depending on the number of actors (greater than two) and on their relationship the combination of coordination mechanisms within a partnership cannot be excluded to make the business processes more effective.
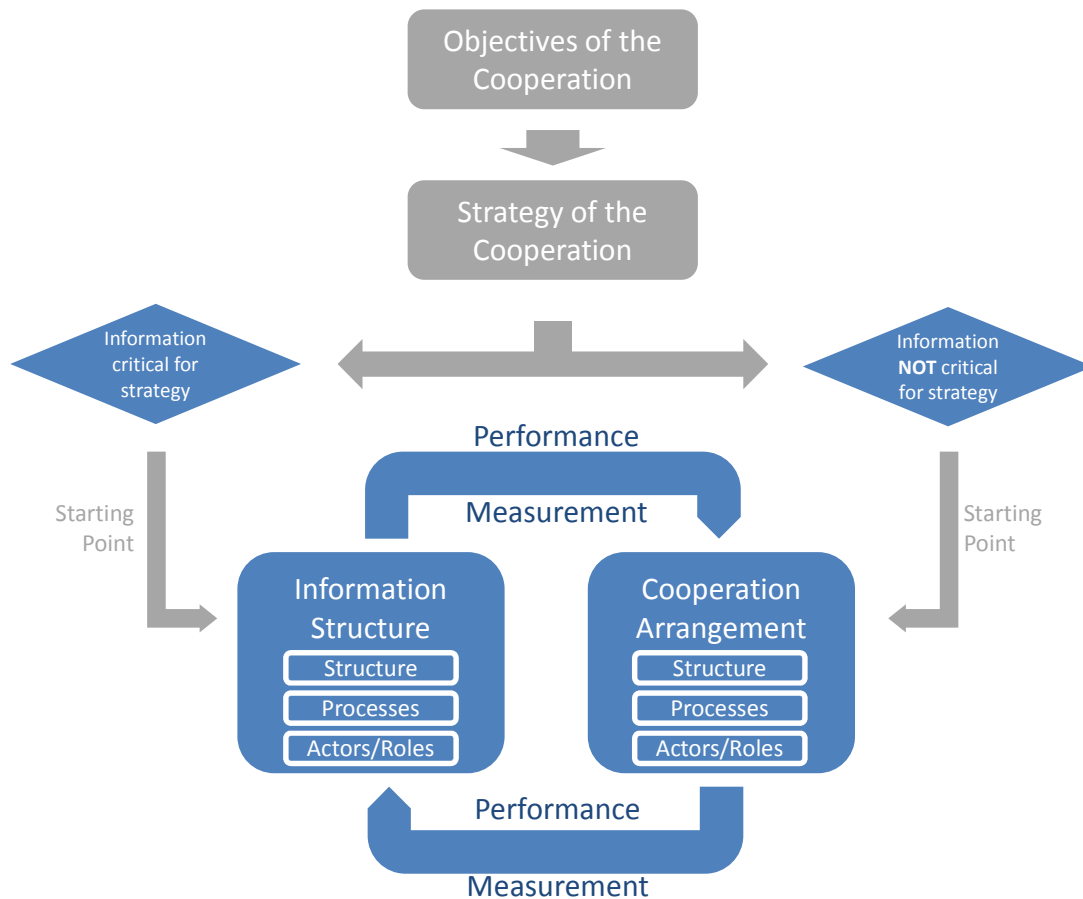
Figure 1: Aligning information and cooperation arrangement

In this way the model assumes full compliance of information structure to the business arrangement to ensure the required congruence. Depending on the relevance of cooperation aspects our model proposes to align the information structure with the cooperation arrangement or vice versa. If the transfer of knowledge or information is highly strategic relevant, the

information structure should determine the cooperation arrangement. When information exchange has a supporting function, the information structure has to be aligned to the cooperation arrangement. The alignment process is always steered by results of performance measurements (Figure 1).

The objectives and competencies of the participants determine the common strategy and starting point of building the information structure or cooperation arrangement. The value of information sharing only increases if decision rights related to that information are also transferred to the cooperation partner (Seidmann and Sundararajan, 1998). Since this situation can potentially increase profits, it can also lead to undesirable information asymmetry. For this reason, only under the condition of common or complementary goals, the problems of transferring the decision rights are reduced. Both the goals of each partner and the goals of the cooperation indicate the direction of the production processes and define the domain for measurement and analysis of performance and quality.

DETAILS

Next we consider the individual components of the model and go deeper into their contribution to the information structure and functions.

Structure

As well as in the determination of network strategy the objectives form the framework for future information structure. We define the structure functions in accordance to Martin and Behrends (1998):

1. determination of system boundaries by defining the system components

2. regulation of processes by promoting the occurrence of certain processes and limiting the range of possible interactions between the system elements

The information and knowledge ownership together with the objectives of cooperation determine the state and governance profiles. Based upon whether it is mono- or polycentric profile the appropriate coordination mechanism (hierarchical, hybrid, market) is selected.

If all the tasks of information supply are performed by a central unit it is easier to ensure the consistency of transmitted information (Picot et al, 2003). From a technical perspective, the data and information resources of the cooperation will be presented at a global level, thus avoiding redundancy and maintaining actuality. Hence, the data for the demanding processes is accessible and information connections in the network are clear. Another advantage of the centralized solution is a flexible integration of new partners. A disadvantage can be seen when the cooperators don't want to accept central guidelines, if inter-company processes require arrangements. It can also be problematic to determine who will provide the central leadership (Picot et al, 2003).

In a distributed solution all partners take the responsibility and the coordination efforts. A disadvantage might be the interface problem, e.g. if the partners use incompatible ERP systems (Picot et al, 2003). At this point standardization has to occur, which can take time and creates additional costs.

To solve this problem, Picot et al. (2003) propose a combination of centralized and decentralized models. Therefore the network participants determine their internal information flows and a central authority takes over the inter-organizational information supply according to certain specifications. This approach was also taken by IT governance initiatives in big corporations (Peterson, 2004; Weill and Ross, 2007). The so called federal approach combines advantages and weakens the disadvantages of pure centralization or decentralization.

Hence, the structure forms the foundation for allocation of responsibilities and resources to the participants. This distribution and the associated decision rights influence the structure, the roles and the responsibilities of network participants and in this way determine their information needs.

Processes

Even when full information is available in the cooperation, the performance can be sub-optimal "when each decision maker optimizes her individual objective function" (Sahin and Robinson, 2002). Hence, processes within the information structure are designed through partitioning the cooperation into two layers – micro and macro layer.

According to the concept of data governance on the micro layer each actor has to define the supplying processes, responsibilities and roles according to common guidelines. The macro layer defines the holistic framework and specifies the inter-organizational responsibilities, coordination tasks and processes. This approach aims to raise awareness of the related data dependencies among the various sectors, e.g. by the definition of data collection standards and data quality principles

within the cooperating organizations. Accordingly, the concept is aimed to enable the cooperation-wide definition of the quality standards and its control (Weber et al., 2009).

The information has to be prepared corresponding to the quality standards and transmitted following the guidelines. Therefore the following three steps have to be taken:

Identification of information demand

The own requirements regarding the scope and quality of information are collected and the possible demand of cooperative partners is estimated. Due to the possible different levels of interaction the information needs and pursued objectives can vary (Samaddar et al., 2006). To support the inter-organizational processes the actual information about the state of cooperative processes would be relevant.

Classification of data

For this task we use the four level scheme by Seidmann and Sundararajan (1998). The information has to be classified because of interdependencies to the scope of information sharing and governance profile. Samaddar et al. (2006) describe examples for this relation:

- For low volume of information sharing a market coordination mechanism would be sufficient.

- Big amount of operational data leads to the demand of sequential business process integration.

- Low volume of strategic relevant information leads to a high demand of coordination, where business processes are interdependent but not complex.

- Big amount of strategic relevant information leads to a very close collaboration which requires extreme trust and commitment.

Hence, the comparison of information needs with the type of information covering this need allows choosing the efficient coordination mechanism and sets the parameters for the technical realization of information exchange.

Design of information flows

Quality standards, data exchange formats, information descriptions and technical conditions have to be negotiated to enable the compatibility from business and technical perspective. Laws and regulations might be of special interest in cross-border cooperations.

The compliance with the guidelines has to be enforced on the micro level. Three general tasks have to be carried out to ensure control over the quality of information and data management (Otto et al., 2011).

- key parameters or indicators must be introduced to enable proper analysis, refinement and validation of the quality of information and data;

- responsibilities and roles must be defined, that guarantee the quality of information and data;

- lifecycle of information and data from their creation to archiving and destruction shall be determined in all processes.

The transmission processes can be designed according to existing logistic principles like just-in-time or common data pools (Mertens et al., 1998). This logistic perspective has already been adopted (Dinter, 2008; Otto 2011, Sandkuhl, 2008) but we want to widen the focus to all levels of information presented above, which means not only information for decisions support, but full operational and strategic information. As Seidmann and Sundararajan (1998) and Sahin and Robinson (2005) highlighted that the exchange of full information is a critical success factor. We accent, that the business concept and the whole information structure should be in the center of attention.

Sahin/Robinson (2005) presented based on results of experimental mathematical model an average cost reduction of 47.58% in the cooperation with full information sharing strategy. This example highlights the influence of governing actors to the success.

Actors/Roles

The processes have to be rolled out and controlled by specific roles on both levels of the cooperation. Therefore existing roles can be used and extended with the tasks we described above. The dynamic of cooperations has to be kept in mind. Hence, the states of the information structure and cooperation arrangement have to be evaluated and aligned constantly. Depending on

the type of cooperation it might be essential to define committees to negotiate strategy and guidelines and to moderate conflicts.

Based on the definition of roles by Kooper et al. (2011) and the data governance approach, the inter-organizational information alignment has to incorporate the creator and receiver roles, as they determine the information demand of network members. The governing role is determined by common rules or guidance on macro layer which will incorporate the tasks of interaction between creator and receiver. This considers the question "to whom is the value is optimized" (Kooper et al., 2011). We distinguish again between roles on the macro and on the micro level.

On the micro level we use the existing roles of IT Governance and add new tasks. We suggest following roles:

The *Chief Information Architect* deduces information exchange guidelines within the network from the point of network strategy view. This role has the governing perspective and acts as intermediary between demand and supply of information. The Chief Information Architect is responsible for the value creation through information exchange.

The *Information Architect* deals with tasks connected to data inside an organization. This covers following aspects: information lifecycle management, rights management for CRUD operations, quality and criticality assessments for data and information in connection with underlying applications and the using business processes.

Building upon the knowledge of information architects newly added tasks in the context of aforementioned processes have to be carried out. In the creating perspective the information architect manages the collection and conversion of data to match the needs of the cooperation and to comply with the network's strategy and guidelines. In the receiving perspective the needs of the single organization have to be collected, prioritized and formalized. Also the right providers have to be chosen and requirements for data formats must be defined. The distribution of received information to requesting functions and business processes is crucial, because the value delivery of the information exchange depends on the supply of information needs. Also technical aspects of storage, safekeeping periods, and availability have to be managed.

On the macro level we propose two following roles.

The *Inter-organizational Alignment Board* consists of the senior management of the network participants. It approves the cooperation arrangement and the corresponding information structure. Also this board acts as the decision-making body in case of conflicts between organizations. The board forms working groups for different aspects or assigns special tasks to the chief information architects.

The *Cooperation Architect* serves as the counterpart of an Enterprise Architect in single organizations. The Cooperation Architect has to document, model and enforce the further development of the cooperation. This role is the connection between chief information architects of the cooperating organizations and the cooperation as a whole. The Cooperation Architect develops blueprints, proposals and indicators for network members. Since the role has no explicit power over the other organizations, communication, consensus management and escalation of conflicts are main tasks. In the case of big cooperations an organizational unit like a shared service centre can provide specific services for the cooperation.

Performance Measurement
Beside the measurement of value delivery from the cooperation's activities, the control and monitoring mechanisms observe the compliance of activities with the network strategy. This increases the goal congruence, which is important for efficient cooperating. It is difficult to measure information resources and to evaluate their impact on economic returns (Chen et al., 2009). Therefore financial ratios are can be adequate to quantify the impact of information and data flows as compared to financial success of the cooperation or of single actors. Another way can be chosen if the observability of processes executed by the partners is high enough. Behavior-based control can be used if "[...] the controller has knowledge of the transformation process, which delineates the behaviors that will transform inputs into outputs" (Chen et al., 2009). Alternatively each actor can define own ratios based on the goals to measure the success. The performance indicators and measurements can deliver important hints for optimizing structure, processes and tasks.

RELATED WORK

Beside the presented and used approaches a lot of neighboring research areas exist and have to be considered when the model will be enhanced.

In the context of a single organization the enterprise architecture management (EAM) contributes to the transparent description of necessary elements and their relationships in organizations (Op't Land et al., 2009). This approach may provide information to all micro-level processes needed. A "network architecture management" at the macro level would be a good basis for inter-organizational information alignment. The first steps are taken by the Extended Enterprise Architecture (Schekkerman, 2008).

The approach of business ecosystems has interesting links and can contribute a different perspective to our model. Business ecosystems can be defined as an economic community supported by a foundation of interacting organizations and individuals – the organisms of the business world. A business ecosystem includes customers, lead producers, competitors, and other stakeholders. The key to a business ecosystem are leadership companies, who have a strong influence over the co-evolutionary processes. The relation can be easily seen, since cooperations can form an ecosystem and are part of ecosystems (Peltoniemi and Vuori, 2004, Zhang and Fan, 2010).

Information Governance, as partly used, sets out the shortcomings of IT governance and proposes a focus on the governance of information as a promising approach. The concentration goes beyond the traditional management of data. Information governance is defined as "seeking and finding, creation and use, and exchange of information". Although this approach focuses on single organizations the exchange of information is a core concept they see (Kooper et al., 2011).

The works of Madlberger and Roztocki are closely related to the topic of this paper. Their research focuses on aspects of cross-organizational and cross-border collaboration with the use of IT. In their literature reviews (Madlberger and Roztocki, 2008, 2009, 2010) they show the only slowly maturing field of research in the area of cooperations.

DISCUSSION AND CONCLUSIONS

Data and information become more important for business success because of providing the essential items to enable better decision making. IT enables the redesign of business models and processes, but information and knowledge are the keys to new solutions. The presented conceptual model incorporates relevant aspects of information exchange in cooperations and can be helpful when analyzing the formation and the fail of any cooperation arrangement which highly depends on information exchange. The model gives detailed suggestions for the building of suitable structure, processes and roles to enable an effective information exchange and governance within the cooperation.

The implementation of our model requires a sophisticated overview about the information and data in the organization as well as investment in human resources and supporting tools. This can probably limit the applicability to big or medium-sized companies with a professional management of IT.

The proposed model is only conceptual. In a next development step the model has to be further refined through empirical research. The adaptation for practical usage is very important and is underlined through the choice of basic approaches. With the help of action research or case studies the potential of the model can be tested to get hints for further refinement. Detailed metrics for performance measurements are still needed to control the alignment process and are part of further research. Besides this we plan the research of coordination methods which can effectively manage the exchange of information and data. Also the integration and bordering of neighboring approaches is planned.

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