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A Semantic Sense & Respond Approach to IT-enabled Buyer-Supplier Relationship Management: An Action Research Study

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ABSTRACT

The importance of buyer-supplier relations has been recognized by research as well as practice. Information sharing and knowledge exchange have been found to positively impact closer collaboration, increase transparency, and improve perceptions of trust between buyers and sellers. There is however, lesser research about IT as an enabler in the dynamics of buyer-seller relationship management. Against this backdrop, we examine how a retailer leveraged and adapted a portal to help them “listen to the voice of their suppliers”. Through a collaborative action research project, we developed a semantic sense & respond approach to design and implement mechanisms that allowed a large retailer, *BuildSmart*, to continuously sense how their portal was experienced by suppliers and how to more generally improve their relationship with their suppliers. As a result, we present a conceptual model of IT-enabled buyer-supplier relationship management, and demonstrate how semantic modeling can be combined with sense & response thinking to support adaptive technology management.

Keywords

Collaborative Action Research, Supplier Relationship Management, Sense & Respond, Supplier Portal, Conceptual Model, Buyer-Seller Relations, Semantic Approach

INTRODUCTION

Supply chain, as a key function of organizations, has drawn much attention in practice and in theory. Supply chain efficiency and effectiveness are the backbone of organizational performance ensuring customer value and driving competitive capability. Supplier management, as part of the upstream supply chain operation, is a critical component in ensuring a smooth material and information flow across the chain and Information Technology (IT) plays a key role in enabling this co-operation through improved visibility and alignment across the value chain. Various forms of IT have been widely used to coordinate various functions of the supply chain so that B2B (business to business) activities can proceed with the highest degree of efficiency. More recently, organizations are using web portals as a single-entry point platform for collaboration and information sharing across the supply chain. Although research has focused on IT-enabled customer relationship management, there is relatively limited research into the dynamics of how buyers manage their relationship with suppliers enabled by IT. Such knowledge could be useful because relationships in contemporary business networks are highly volatile and need to be managed in an adaptable manner. Developing and maintaining a good relationship with suppliers not only encourages transactional efficiencies such as timeliness and good quality, but can also provide other benefits especially useful for retailers, such as development of innovative products, sharing of market knowledge and exclusive contracts.

The practical problem faced by a large US-based retailer, *BuildSmart*, was to find a way to continuously adapt their supplier portal so that it served effectively as a coordination tool for buyer-supplier relationship management. Our engagement to help address this problem allowed us to examine, within a practice setting, how to practically leverage and adapt IT for up-stream purposes by allowing *BuildSmart* to continuously “listen to the voice of its suppliers” and thereby improve coordination and transparency in their relationship to suppliers. Since our research was motivated by the dual goals of 1) solving an immediate practical problem at *BuildSmart* and through that process 2) acquiring new knowledge on IT-enabled buyer-supplier relationship management, we adopted an action research (AR) (Avison et al. 1999) approach. Specifically, the canonical Susman Evered (1978) form of AR, provided structure to our research, complemented with a variety of data-collection methods, most of which were interpretive (such as interviews, discussions and workshops) and some of which were quantitative, such as surveys and metrics. To ensure a rigorous approach to AR, we adopted the principles of Canonical Action Research (CAR) to evaluate our dual project goals (Davison et al. 2004).

As a theoretical framing device and to support our practical problem-solving at *BuildSmart*, we combined conceptual modeling (Trochim 1989) with a sense & respond approach (Wand and Weber 2002) to management of technology and buyer-supplier relationships. The sense & respond approach helped us apply adaptive thinking to the use of IT at *BuildSmart* and the conceptual modeling provided a systematic approach to understand the content of the relationship between *BuildSmart* and its suppliers. Hence, our research addressed the following research question: How can a semantic sense & respond approach support continuous adaptation of IT-enabled buyer-supplier relationship management? As a result, we present the experiences from the interventions into *BuildSmart*, we provide a conceptual model of IT-enabled buyer-supplier relationship management, and we demonstrate how semantic modeling can be combined with sense & response thinking to support adaptive technology management. In conclusion, we discuss the theoretical as well as managerial implications of these contributions.

The rest of this paper proceeds as follows. In the next section we present the theoretical background of the research and identify the gaps which our research aims to address. The Research Method section provides the theoretical framing of our problem-solving at *BuildSmart*, followed by a detailed account of our action research approach. Next we present the Results of the problem and research cycle and finally we review our learning from both these cycles, limitations of our research and future research possibilities.

THEORETICAL BACKGROUND AND FRAMING

The importance of collaborative buyer-supplier relations has been embraced by both research and practice (Haeckel 1999). Research demonstrates a “positive relationship between information sharing capability and buyer-supplier relationships (Davenport 2000; Haeckel and Nolan 1996). Based on their research of over two decades of buyer-supplier relationship literature, (Gunasekaran and Ngai 2004) encourage “more focused studies of the relationships between buyers and their strategic suppliers” to provide keener insights “into the actual practices, and mutual efforts of buyers and their suppliers”. As contemporary business environment faces new challenges, the buyer supplier relationship domain provides opportunities to investigate the dynamics of cooperation between these parties (Dias 2001).

IT systems have played a key role in enabling this co-operation through improved visibility and alignment across the value chain (Gunasekaran and Ngai 2004; Rai et al. 2006). In order to achieve an integrated value chain, IT-enabled systems such as Enterprise Resource planning (ERP) and Electronic Data Interchange (EDI) have been widely adopted to improve information exchange between buyer and supplier. Improved communication and information sharing provide significant supplier quality improvement (Terpend et al. 2008). Supplier portals have been employed in many organizations as a mechanism to improve communication and information sharing across the supply chain (Dias 2001). It is believed to provide benefit to the inter-organizational relationship beyond the improvements in purchase process efficiency or to the performance of buyer-supplier logistics processes (Baglieri et al. 2007). However, there is relatively limited research into the dynamics of how buyers utilize portals to enable buyer-supplier relationship improvement.

More recently, the significance of “ease of doing business” has been recognized as a factor in improving buyer-supplier relationships (Susman and Evered 1978). However, we have limited knowledge about how companies leverage IT systems, particularly supplier portals as enablers of business processes, leading to improved buyer-supplier coordination and transparency. Therefore we conducted an action research study at *BuildSmart* to examine the role of IT and how it can be leveraged to help improve collaboration with its suppliers.

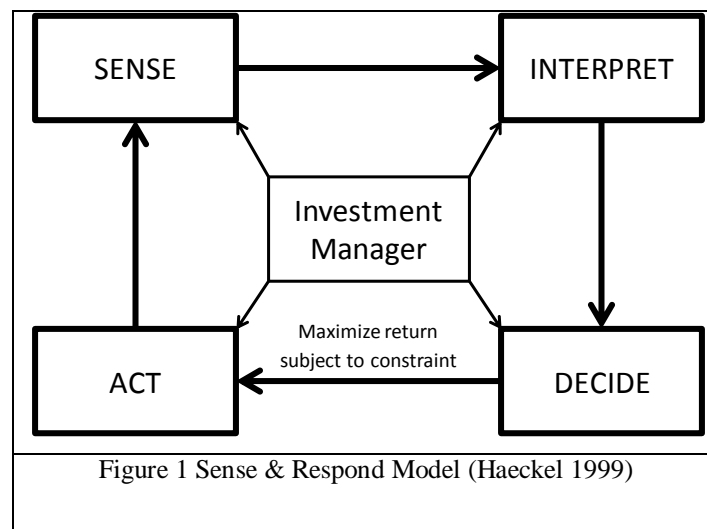
Sense and Respond

When coping with continuous changes, a sense & respond company “invests in a mass customization capability to produce a high volume of low-cost “snap together” offering from modular elements in response to unique customer requests” (Wand and Weber 2002). Haeckel (1999) proposed an “adaptive loop” as a useful template for business people to use in designing extremely change-sensitive processes with rapid response requirements. Figure 1 illustrates the generic adaptive loop: it demonstrates how sensing of data gives the organization the ability to respond faster thus leading to rapid actions to adapt to changes. Firms utilize technology to increase their adaptability by gathering and processing more data in more detail more frequently and by improving decision-support analyses (Davenport 2000; Haeckel and Nolan 1996). IT allows companies shifting to a sense & response organization by reducing the constraints imposed by time and space in acquiring, interpreting and acting on information (Haeckel and Nolan 1993).

However, while the sense & respond framework provides a solution for organizations to react to a dynamic change environment, the framework does not provide guidance on how problems may be identified and organized for interpretation and solution. In this context, we propose a semantic approach to sense critical problems by using conceptual modeling as a practical tool.

Conceptual Modeling

Conceptual Modeling is a structured approach which can be used to develop a conceptual framework represented in the form of a picture or map (Trochim 1989). It is viewed as a transformative process to be used as a mechanism for organizational learning, which has the ability to bring together diverse perspectives and values to conceptualize and represent complex constructs in a clear and systematic manner (Sutherland and Katz 2005). “To construct the model, ideas first have to be described or generated, and the interrelationships between them articulated (Trochim 1989, page 1).” Through discussion among stakeholders, a conceptual model is then produced as a visual representation of the information and knowledge (Sutherland and Katz 2005). It is used in a wide variety of domains including IT systems development (Wand and Weber 2002), management (Carroll 1979; Parasuraman et al. 1985), and education (Novak 1990). In education, it is referred to as concept mapping. Mapping of concepts plays a powerful role in clarifying ideas, and organizing and representing knowledge and has been widely used in education and learning to help clarify the various concepts and their inter-relationships (Novak 1991; Novak and Cañas 2008). Concept maps can help to probe the human cognitive structures and to represent these structures by linking concepts within a framework of propositions (Daley 2004). Moreover, spoken or written language is linear, while mapping of interrelated concepts can provide a rich picture and a nuanced yet structured way to represent ideas.



Semantic Sense and Respond Approach

The difficulty in accurately capturing and understanding the information that must be exchanged through the sense & respond framework can result from problems in transferring tacit knowledge (Nonaka 1994; Polanyi 1983). Additionally, there is a degree of dependence across inter-firm boundaries such as in the case of buyers and suppliers that necessitate the development of common knowledge which requires rich communication and translation (Carlile 2004). We argue that this translation of shared meaning, in a systematic way can be assisted through the use of a conceptual model. The conceptual model can serve as a “common cognitive ground” (Nonaka and Takeuchi 1995) for sensing the needs of the suppliers.

Dynamic capability (Eisenhardt and Martin 2000; Teece 2009) and sense & respond methods are applied by many firms. In the Supply-chain environment in addition to having an adaptive supply-chain there is the additional need to maintain strong buyer-seller relations. The semantic sense & respond model is therefore well-suited to meeting these dual requirements.

RESEARCH METHOD

The origin of this research was at the behest of our contact, a Project Manager at *BuildSmart*, who required help with getting measurable and actionable feedback regarding the implementation of a supplier portal. *BuildSmart* wanted to use this opportunity to improve their relationship with their suppliers. We saw this as an opportunity to make a difference by solving a real-world problem and at the same time develop a better understanding of how IT systems could serve as a mechanism for improving the buyer-supplier relationship. In order to develop a better understanding of the problem situation we needed to work in close collaboration with the practitioners. This problem-solving research exercise required an immersion into the “social practice of real-world setting” and “reflection on the collaborative involvement and its outcomes” (Checkland and Holwell 1998). The study had two objectives:

1. to help the organization solve the problem of measurement of supplier relationship improvement
2. to develop new knowledge through seeking improvement solutions to “real-life” practical problem situations (McKay and Marshall 2001)

Since we had to accomplish the “double challenge” of “studying the organizational phenomenon” and “changing it” (Avison et al. 2001), action research was the most appropriate research approach. Additionally, our research had the following characteristics making it suitable for action research (Argyris et al. 1982; Checkland and Holwell 1998):

- A collaborative process between researchers and people in the situation
- A process of critical inquiry
- A focus on social practice, and
- A deliberate process of reflective learning

Hult and Lennug (1980) define action research approach as one that “simultaneously assists in practical problem solving and expands scientific knowledge, as well as enhances the competencies of the respective actors, being performed collaboratively in an immediate situation using data feedback in a cyclical process aiming at an increased understanding of a given social situation, primarily applicable for the understanding of change processes in social systems and undertaken within a mutually acceptable ethical framework.” Action research (AR) was introduced as an IS research methodology by Wood-Harper (1985) as cited in (Baskerville 1999). To avoid any epistemological confusion regarding the term “methodology” in reference to AR (DeLuca and Kock 2007), in this paper, we will henceforth refer to AR as an approach, technique or method. AR has recently attracted increasing attention as an important research method for developing both practically relevant and theoretically interesting contributions (Chiasson et al. 2009). Collaboration between the researcher and “problem owner” is essential to the success of the AR process. Both the researcher and the problem-owner rely on their mutual skills, experiences and competencies in order to achieve the dual goals of practical problem-solving and the generation of new knowledge and understanding (McKay and Marshall 2001).

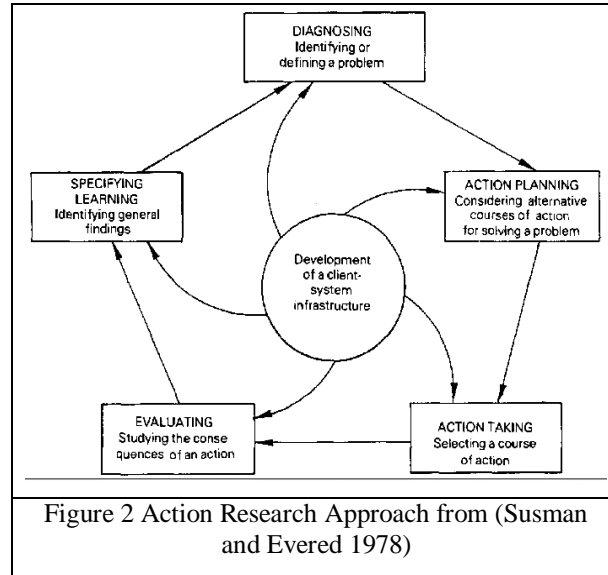
The classical Susman & Evered (1978) model (Figure 2) is widely used in conducting action research and has assumed a canonical status (Davison et al. 2004). We therefore adopted this model to conduct our research. We believe that this approach was most suitable since it would provide a layer of rigor to our (primarily organic) research through its structured processes (Baskerville and Wood-Harper 1996). Additionally, these processes formed the basis for communication and follow-up with our practitioner partners and enabled the development of the client system infrastructure through a researcher client agreement (Chein et al. 1948). In order to ensure and assess the rigor and relevance of the research, we were guided by the principles of canonical action research (CAR) (Davison et al. 2004).

ACTION RESEARCH AT *BUILDSMART*

*BuildSmart*¹ is a large US based home improvement retailer. It sells an assortment of building materials, home improvement and lawn and garden products and provides a number of services. *BuildSmart* has more than 4,000 suppliers ranging from multinational corporations to small family-owned companies. The suppliers consider it “difficult to do business” with *BuildSmart* and often need to deploy additional resources to conduct business with *BuildSmart* compared with its competitors. *BuildSmart* has a Supplier Center website which provides contact information and information regarding business processes. In order to consolidate its existing information systems, *BuildSmart* decided to implement a supplier portal which would provide a single-point access to various functions. The design of the new portal was based on feedback

¹ Name changed to ensure anonymity

collected from a focus group of suppliers. Additionally, a knowledge base was incorporated into the new website to provide access to information and documentation required to conduct business with *BuildSmart*. The website was part of a series of efforts undertaken by the firm to improve the business experience with its upstream partners. The supplier portal was ready to go live and *BuildSmart* recognized the need to evaluate and improve its efforts based upon feedback from its suppliers. They wanted to find some way of capturing the “voice of the supplier” in the form of measurable action items. Their objectives therefore, were to not only measure the portal’s usability, but also relationship improvement.



The research project was initiated through a contact at *BuildSmart*, who managed the supplier portal implementation. The Project Manager identified that the key issue was acquiring the suppliers’ feedback for continuous portal enhancement. Although the firm was motivated to listen to the “voice of supplier”, and conducted surveys and focus groups, there was no mechanism to clearly and continuously sense the needs of the suppliers and adaptively respond to the changing needs. We conducted a 5-month action research study at *BuildSmart* aimed at solving the practical problem and also improving understanding of buyer-supplier relationship management.

Diagnosis

The meetings (Table 1) were conducted at *BuildSmart* with two managers, one in charge of the implementation project and the other in charge of supplier support and training. Through these meetings we gathered information about the functionality of the supplier portal, the support and training processes and the problem requirements. As is often the case in conducting AR, over the course of the engagement and discussions with *BuildSmart* and their suppliers, as our understanding of the processes grew, the problem requirements evolved and changed. Initially we were interested in assessing whether the portal’s functionality met the needs of the suppliers. Subsequently, three key measures support, training and engagement were identified in assessing the effectiveness of the portal. One of the managers described these as follows:

...“ Support is whether you can find the right resource. It’s not necessary every resource is helping you because we have no control over that, but can you find the right resource? Is the right information out there? Are you reading the (training) documents? And the engagement is whether you feel you have direction now. That is what we are trying to achieve with this homepage by putting alerts, action items ...and we will have scorecards so they understand that they can look at the homepage and understand what they need to do for that week.”

Table 1 Number of interviewees and their roles

Operational Role	# of interviewees	# of interviews
Project managers	3	7
Suppliers	5	6
Sum	8	13

Action Planning

Since buyer-supplier relationships involved *BuildSmart* and their suppliers, it became imperative to collect information from both these entities. Hence we conducted phone interviews with the suppliers to understand 1) their perspective of the portal, and 2) their problems in conducting business with *BuildSmart* and how their relationship with *BuildSmart* could be improved. The interviewees were the super-users who were the representatives at the supplier firms who were familiar with functionality of the portal. The feedback from the suppliers was encouraging. They were pleased with the improvements and felt that it helped improve their operational processes, and also improved their working relationship with *BuildSmart*. However, there was room for improvement both with regards to the portal as well as processes that could be smoothened to enhance the suppliers' experience in conducting business with *BuildSmart*. Organizations are dynamic entities and in order to be continuously receptive and adaptive there is a need for a mechanism to sense & respond dynamically. *BuildSmart* wanted to take such pro-active steps to put in place a mechanism for sensing and responding to their suppliers by listening to the "voice of the supplier" thus providing them with excellent interaction experience.

Action Taking

Based on the interviews and discussion with *BuildSmart* managers and a core group of suppliers, we developed a conceptual model of the sense & respond relationship between the suppliers and the firm (Figure 3) which provided the basis for constructing a survey instrument for measuring the outcomes of 1) features of the portal, and, 2) *BuildSmart*'s ability to listen to the "voice of the suppliers". The conceptual model provided a basis for understanding the importance of the elements that would help *BuildSmart* provide a better business experience to their suppliers and at the same time help suppliers better engage with *BuildSmart* through the portal. Through this conceptual model, we were also able to identify that the portal was one channel of a portfolio of processes that *BuildSmart* used to connect with and collect feedback from the suppliers. The firm had a portfolio of processes which could be leveraged for a two-way communication with their suppliers: surveys, focus groups, conferences and workshops.

Evaluation

Following the guidelines of canonical action research (Davison et al. 2004), the evaluation was a collaborative process between the researchers and practitioners and included evaluating the model as well as the survey. Also, we were guided in the action research by the following principles:

- The principle of researcher-client agreement
- The principle of the cyclical process model
- The principle of theory
- The principle of change through action
- The principle of learning through reflection

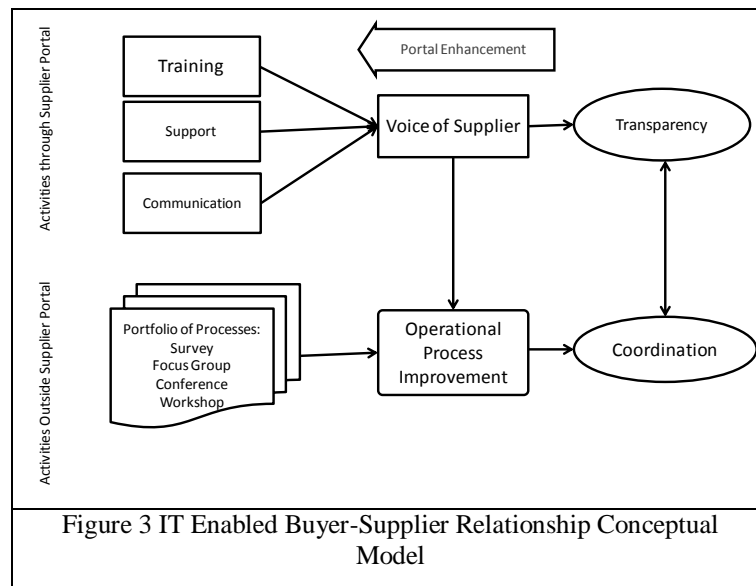
Learning

The beauty of action research is that the findings of a research can often be a surprise and lead the research in interesting directions. Although the research initially began with measuring the functionality of a portal, it evolved into a study of the effectiveness of the portal and further evolved into how it could be leveraged to improve buyer-supplier relations beyond providing operational process efficiencies. While the portal was intended for information sharing, communication, reporting, and support, it could also provide a means for collecting information about its use. By measuring the level of training, support and communication that the portal provided, *BuildSmart* was able to "sense" how well they met the suppliers' needs. While the portal itself would not be able to change existing complex business processes in the company, it could enable data collection thereby providing feedback for operational business process improvements, and ultimately improve transparency and coordination between the buyer and suppliers.

RESULTS

The conceptual model (Figure 3) based on the results of the diagnosis and analysis provided the foundation for creating the original survey instrument and for assessing its results and modifying it before the revised instrument was sent out to the suppliers. We developed items to measure the constructs of “training”, “support” and “communication”. *BuildSmart* piloted the survey instrument with their focus group of suppliers. Subsequently, the refined survey (provided on request) was rolled out to over 300 suppliers for testing. 88 responses were collected over a two-week period. We conducted data analysis and provided a thorough analysis which allowed *BuildSmart* to identify short-term as well as long-term measures to enhance the portal and improve business processes.

Through this action research, we presented an IT-enabled buyer-supplier relationship conceptual model to explain how a company utilizes a web portal as an enabler to improve their relationship with suppliers. Additionally, by combining conceptual modeling with sense & respond framework, we established a semantic sense & respond approach to allow firms to resolve their problems efficiently and economically and also improve relations with their suppliers.



DISCUSSION

The conceptual model developed as a result of the diagnosis and the analysis, served as the foundation for creating the survey instrument. We believe that semantics clarify the concepts when applying a sense & respond approach. The ability to sense & respond is important to any firm in this dynamic business environment. Managing buyer-supplier relationships is particularly challenging; therefore having an adaptive sense & respond relationship is essential. Instead of simply sensing and responding, through this action research we found that it is useful to use a structured and systematic way to investigate how the firm can sense the suppliers' needs. We adopted the conceptual model as a boundary tool to help define the semantics of what the firm needed to sense. Doing so enabled the team to design and develop a pilot survey instrument and to distribute it economically and precisely. The conceptual model was also used to revise the survey instrument based upon the feedback from the original survey. The revised survey was distributed to the whole group of suppliers. The responses from this survey provided the firm with a better understanding of their performance as perceived by the suppliers. It also provided measurable and actionable items for improvement by the firm with regards to the design and performance of the supplier portal.

From a practical perspective the semantic sense & respond model can be used to facilitate cross-boundary knowledge transfer and development of shared understanding across business networks. Hence in the considered case, at *BuildSmart*, it not only served as a basis for sensing & responding to the suppliers' needs but in doing so it became a mechanism for improving relationships with the suppliers because it allowed *BuildSmart* to listen to the “Voice of the Supplier”. The proposed model may therefore serve the dual purpose of providing a firm an ability to understand the needs of other actors across the business network at the same time provide these actors a sense of empowerment and engagement with the business in their relationship to the firm and the business network. Accordingly this model can be used in different scenarios that are similar to the one recorded at *BuildSmart*. This extension of applicability is visible in the early stages of our research. What began as a local solution to a specific problem faced by a certain project was extended in scope to other parallel functional groups within *BuildSmart*. For researchers, this paper provides a novel approach to look at web portals, not just as a communication

platform but an adaptive and dynamic tool of information exchange and relationship building. Obviously, there are other ways besides a survey for collating information about the effectiveness of the portal such as capturing usage information directly through the portal. This calls for further research in this area. The model will also benefit from further evaluation in other organizations and periodic surveys will reflect the effectiveness of the survey and the firms' ability to act on the information it receives.

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