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MAKING & GIVING SENSE TO THE GLOBAL DATA SYNCHRONIZATION NETWORK STANDARD ADOTPION

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Research-in-Progress

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Abstract

Despite the widespread diffusion of interorganizational systems (IOS), both retailers and manufacturers suffer significant inaccuracies, flaws, and discrepancies in product information, which undermines the quality of the data they exchange. To remedy this situation, an interorganizational Global Data Synchronization Network (GDSN) standard has emerged since the beginning the last decade. Initial enthusiasm about this cutting-edge standard notwithstanding, the technology has not reached the adoption breadth predicted by business consulting firms and technology initiators. This research uses sensemaking/sensegiving theoretical lenses to conduct an in-depth, qualitative case study of five groups of stakeholders (retailers, manufacturers, standards setters, data pools, and certified GDSN providers) in an attempt to unravel the barriers to GDSN standard adoption.

Key words: standards, adoption, sensemaking, sensegiving, GDSN, case study, interpretive.

Introduction

Even with the vast diffusion of electronic data interchange (EDI) applications across industrial contexts, including retail, companies on all sides of the supply chain still experience poor data quality issues and flawed interorganizational product information that harm their supply chain performance (Accenture, 2006; Nakatani et al., 2006). A 2009 SAP report summarizes the severe impact of unsynchronized data on firms throughout the supply chain, including costs of resolving catalog disparities (US$60–80 per error, inaccuracy rates between 30–80% in all item data), reconciling invoices (US$40–400, estimated rate of 60% erroneous invoices), and lost sales opportunities (four-weeks average product roll-out times; 3.5% of total sales volume lost due to inaccurate data).

Research has emphasized the impact of IOS use on data quality (Zhu et al., 2006). This is particularly the case of a new interorganizational system (IOS) – GDSN – which propose to resolve these issues by improving the quality of exchanged data in the supply chain (Legner and Shemm, 2008). This Global Data Synchronization Network (GDSN) standard involves "the timely and accurate updating of any finished product information across enterprises and borders based on a single, global registry that connects data sources from around the world, enabling data to be standardized and synchronized by trading partners on a near-real time basis" (IBM Business Consulting Service, 2005, p. 7). It has emerged as the big next thing in IOS, predicted to achieve huge success and widespread adoption among organizations, similar to the case of EDI in the 1990s in both the United States and Europe (IBM Business Consulting Services, 2005; Cap Gemini et al., 2002).

GDSN has been promoted by the industry to address problems of data inaccuracy. In that sense, GDSN enables timely updating product data in order to maintain the data consistency between retailers and suppliers (Legner and Schemm, 2008; Nakatani et al., 2006). Processing this updating manually is time-consuming and not far from human errors. Decorbière (2008) demonstrated that the use of GDSN will lead to "data centralization", "automation of flows", additional controls" and "processes standardization" witch are supposed to have "positive impact on several data quality dimensions"(p.8). Moreover, Nakatani et al. (2006) argue that GDSN enables "accurate", "complete", and "consistent data about product and transactions" (p.3). It is also worth noting that GDSN enables many-to-may relationships between retailers and suppliers (Legner and Shemm, 2008) which would permit a high-quality of the data exchanged between the different partners. This makes the GDSN a perquisite for the success of e-collaboration between buyers and suppliers. Thus, GDSN is expected to significantly improve data quality.

Yet GDSN adoption rates remain low (Legner and Schemm, 2008). It appears that classic studies of IOS do not apply to the new generations,[1] which indicates the urgent need for a new understanding of the barriers to adopting the GDSN interorganizational standard, especially because "*as IOS artifacts continue to progress in terms of capabilities and features, the value of earlier research on older technologies diminishes*" (Robey et al., 2008, p. 508). In effect, EDI, which entails cooperative IOS that allow partners to exchange structured business information electronically across separate computer applications (Swatman and Swatman, 1992), differs fundamentally from the GDSN standard (see Table 1). Accordingly, the GDSN standard, which represents a fundamental change in the way companies can manage data through IOS (IBM Business Consulting Service, 2005), deserves new and comprehensive scrutiny. Because "*EDI systems are no longer the state of the art in IOS and research results generated from the first wave of IOS research on EDI are not particularly insightful for understanding the next generations of IOS*" (Robey et al. 2008, p. 508),[2] the field demands further research. Yet as Lyytinen and King (2006, p. 405) note, "*despite the importance of standardization, the IS field has not pursued research on it vigorously. Scholarly discussions are rare, and strong contributions are lacking.*" This exploratory study attempts to go one step further by using sensemaking and sensegiving theoretical frameworks to investigate the barriers behind the GDSN standard adoption.

1. Theoretical Background

1.1 Interorganizational Systems and the GDSN Standard

Standards are "*limited set[s] of solutions to actual or potential matching problems directed at benefits for the party or parties involved, balancing their needs and intending and expecting that these solutions will be repeatedly or continuously used during a certain period by a substantial number of the parties for whom they are meant*" (de Vries, 1999, p. 13). They also are gaining critical importance in various contexts, including those characterized by interactions, such as supply chains (Jakobs, 2008), because of the intensified requirements of business exchanges among supply chain actors (e.g., retailers and manufacturers) (Bala and Venkatesch, 2006). Standards further offer the benefits of facilitating related technology adoption (Shapiro and Varian, 1999). In the context of this study, Table 1 depicts the intrinsic differences between GDSN and classic IOS (i.e., EDI) (see Robey et al. 2008).

Table 1. Differences between EDI and GDSN

	Global Data Synchronization Network	**Electronic Data Interchange**
Features	Automated matching and forwarding of registered product information	Must be triggered by the organization (can also be automated, but still depends on a specific transaction); peer-to-peer
Capabilities	Comprehensive attributes of standardized, interorganizational product information or master data. Supports alignment of price information and party (location) information. No support of transactional data (e.g., ordering, invoicing)	Rich business content including transaction information (e.g., purchase orders, invoices, delivery notifications). Some support for aligning product master data, though this content is not as diverse and robust as GDSN content in that area.
Stakeholders	Information recipients, information suppliers (manufacturers, brokers, importers, distributors), GDSN-certified data pools[3], GS1[4] (Global Registry).	Information recipients (retailers, hospitals, distributors), solution providers, GS1 (sometimes), information suppliers.
Business	Synchronizes product, price, and location	Shares transaction information

[1] Most IOS adoption literature refers solely to EDI (e.g., Chwelos et al., 2001; Iacovou et al., 1995; Premkumar and Ramamurthy, 1995, 1997; Teo et al. 2003).

[2] These authors use "EDI" and "Electronic Data Interchange" as their initial keywords for structuring their review of IOS literature published in the top information science journals.

[3] Operated by consortia of retail and consumer goods companies to collect and redistribute product master data.

[4] GS1 is an international not-for-profit association that is dedicated to the design and implementation of global standards and solutions to improve the efficiency and visibility of supply and demand chains globally and across sectors. The GS1 system of standards is the most widely used supply chain standards system in the world. (adapted from http://www.gs1.org/about/overview)

outcomes	information (master data)	
Adoption process	Networked process in which only certified data pools interact with one another and a central router called GS1. No direct exchange between trading partners.	Interorganizational process where messages usually are exchanged directly between trading partners (or EDI exchange solution provider).
Architecture of standards	All developed on XML	Two syntaxes for the same transactions: GS1 XML and EANCOM[5] (subset of UN/CEFACT's EDIFACT).
Adoption	All data pools have implemented GDSN Standard XML messages according to the same specifications for in-network exchanges. Messages sent to actual trading partners outside the network may involve local adaptations.	Significant variation; both GS1 XML and EANCOM messages can be customized locally to meet regional business needs, so messages may not be 100% interoperable across countries. The syntax adopted (EANCOM or GS1 XML) also varies from region to region and by sector, with no standard adoption pattern (currently EANCOM is the most used syntax, because it was the first to appear, and migration costs to XML are very high)
Alternative competitors	Out-of-network exchanges, retailer-specific requirements, local conventions, sector-specific networks (e.g., healthcare, governmental), and sometimes EDI alternatives for peer-to-peer data alignment	Local EDI standards not part of the GS1 portfolio of globally maintained syntaxes and content (e.g., X12 in North America, TRADACOMS in UK, RyutsuXML in Japan)

1.2 Exploring Standard Adoption through Sensegiving/Sensemaking Lenses

Because new and advanced technologies often are equivocal or ambiguous, the change they evoke includes "several possible or plausible interpretations and therefore can be esoteric, subject to misunderstandings, uncertain, complex and recondite" (Weick, 2001, p. 148; see also Tornatzky and Fleischer, 1990). Weick (2001) contends that new and complex systems, such as the GDSN standard, make different kinds of sense to different stakeholders, whose dense interactions then can be modeled in many different ways, which triggers unusual sensemaking problems. In effect, new technologies tend to arrive in the marketplace in an immature state (Swanson and Ramiller, 1997), which creates incomplete and unstable understanding (Rosenberg, 1994). At the same time, ambiguity surrounds standardization activities (Fomin et al. 2003). Therefore, novel, sophisticated, complex technologies, such as standards (Lyytinen and King, 2006), should trigger meaning and interpretation challenges (Weick, 2001), notably that understanding the social meaning of complex technological innovations is crucial especially during the initial adoption stages (Griffith, 1999) notably when different stakeholders are at stake (Orlikowski and Iacono, 2001; Swanson and Ramiller, 1997). At the same time, prior economic literature has mainly investigated standardization as a rational game between actors (e.g., Bensen and Farrell, 1994; Farrell and Saloner, 1988). Fomin and Keil (2000) note that this reliance on purely economic lenses to analyze rational actors' behaviors, such as the investigation of increasing returns from an installed base (e.g., Arthur, 1989), ignores the social aspect of the standardization process. Thus, because they neglect actors' relationships with others, economic arguments cannot fully explain a standardization phenomenon, (Tilson and Lyytinen, 2005) validating the extent to which "*any investigation of the standardization needs to recognize its social and community dependent nature*" (Fomin et al. 2005, p. 35).

Thus, taking into consideration what precedes from one hand, and seeing organizations as '*interpretation systems*' (Daft and Weick, 1984), from another hand, this study adopts sensegiving/sensemaking theoretical lenses to unravel the barriers behind the GDSN standard adoption.

Sensemaking pertains to the way actors understand, interpret, and create sense for themselves using the information that surrounds a change (Rouleau, 2005), such as the change that accompanies technological innovation (Prasad, 1993). A sensemaking social process helps adopters interpret their environment through interactions with others,

[5] EANCOM is a subset of the EDIFACT standard, which is used worldwide in the consumer goods industry.

construct accounts that allow them to comprehend the world, and react to events collectively (Weick, Sutcliffe, and Obstfeld, 2005). Because of the *interpretive flexibility* inherent to technology (Orlikowksi, 1992), users must create a new sense of what the technology means and its economic implications, particularly during the early phases of standardization, including the adoption phase (Fomin et al., 2003).

Sensegiving instead is an interpretive process (Bartunek et al., 1999; Gioia and Chittipeddi, 1991) in which actors attempt to influence others (Maitlis and Lawrence, 2007), communicate their thoughts about the change to others, and gain others' support (Rouleau, 2005) by redefining organizational (Gioia and Chittipeddi, 1991) and technological realities to match their preferences. Sensegiving may trigger profound consequences that affect decision making (Maitlis and Lawrence, 2007). We further contend that sensegiving activity is crucial for the effective adoption of new technologies, because firms that adopt new technologies face many challenges, notably in terms of gaps in their knowledge and understanding (Attewell, 1992) due to technological, organizational, and market-based knowledge deficiencies (Weigelt and Sarkar, 2009).

Using the sensemaking perspective on the one hand and relying on an institutional view of social cognition as a driver of the organizational adoption of IS innovation on the other, Swanson and Ramiller (1997, p. 459) propose that "*an interorganizational community, comprised of a heterogeneous network of parties with a variety of material interests in an IS innovation, collectively creates and employs an organizing vision of the innovation*" by its communal effort to consider the innovation an organizational opportunity. Standards thus may reflect the enactment of collective action (see Markus et al., 2006), enabled by multiple stakeholders who are involved in their design, development, and adoption. Yet because emergent information systems (IS) innovations, such as GDSN, cannot be readily grasped or articulated, Swanson and Ramiller (1997, p. 460) explain that the organizing vision, through its interpretation function, arises "to encode and provide the necessary interpretations, and to give institutional coherence to initiatives that might otherwise be viewed as of limited relevance, even organizationally idiosyncratic. It suggests that there is indeed an innovation worthy of widespread consideration by potential adopters."

In the case of the technology associated with the GDSN standard, the question of adoption is fundamental and a main prerequisite of achieving the primary technology objectives (Desanctis and Poole, 1994) in terms of expected gains (Markus et al. 2006) and anticipated economic value (Zhu et al. 2006). More precisely, the adoption of standards at the organizational level constitutes a prerequisite of their future diffusion at the industry level (Jakobs, 2008; Markus et al. 2006). In effect then, the value of a standard to a single user (e.g., a firm) depends on whether others adopt it (Weitzel et al. 2006).

2. Methodology

To explore the barriers to organizational adoption of the GDSN standard, through the conceptual lenses of the sensegiving/sensemaking framework, this study employs a qualitative method (Myers and Avison, 2002), rooted in interpretive research (Klein and Myers, 1999; Walsham, 1993). Using a case study (Yin, 2009), this study responds to Lyytinen and King's (2006, p. 406) complaint that most prior work "*has been descriptive and focused on the content of new anticipatory IT standards, rather than examining processes and factors that explain why and how such standards emerge and diffuse or fail to do so*." The limits of existing knowledge about IOS (Markus et al. 2006) and more particularly GDSN standard adoption (Legner and Schemm, 2008) make a case study approach well suited to this underexplored research area (Edmondson and McManus, 2007; Yin, 2009). In addition, Robey et al.'s (2008, p. 509) comprehensive review of IOS literature has demonstrated the need for more theoretical development to clarify the antecedents of new generations of IOS, especially the "antecedents of adoption and implementation of technologies with specific features."

This study also acknowledges the interpretive nature and rhetorical construction of the organizing vision (Swanson and Ramiller, 1997) and the need for methodologies that can explore standard-related issues (Lyytinen and King, 2006). Therefore, it features an interpretive epistemological stance (Klein and Myers, 1999; Walsham, 1993), which allows researchers to establish divergent meanings (Gephart, 2004) and recognize how information systems, as social systems, may be affected by the stakeholders who influence and are influenced by the technological context (Walsham, 1993).

2.1 Research Context

In October 2002, Cap Gemini, Ernst & Young, and the Global Commerce Initiative released the first major business report describing the GDSN standard in the consumer packaged goods (CPG) industry. The report was based on vast expertise drawn from retailers (e.g., Sears, Carrefour), manufacturers (e.g., Kraft, Unilever), and standard organizations (e.g., EAN[6]). However, as its main conclusion, the report also singled out a lack of GDSN standard adoption and the resultant negative consequences, in terms of poor data quality, for the supply chain. As the report succinctly warned, "*Data synchronization is currently relatively underdeveloped. This situation is impeding further improvements in the supply chain*". (Cap Gemini et al., 2002, p. 5)

In August 2008, we entered into a scientific research agreement with a major French retailer, with the goal of unraveling the barriers that prevented the successful adoption of the GDSN standard. The retailer had been struggling with this effort for years. Through this cooperative agreement, we gained access to other key informants, including GS1 France, which facilitated contacts with additional appropriate informants for the case study.

2.2 Data Collection and Analysis

The data collection spanned 13 months (August 2008–September 2009) and relied on qualitative techniques (Van Maanen, 1979). With the awareness that data collection requires careful planning and to improve the reliability of the case study approach, we followed Eisenhardt and Graebner's (2007, p. 27) advice and systematically ensured *theoretical sampling* by which "cases are selected because they are particularly suitable for illuminating and extending relationships and logic among constructs". Thus, we pursued an appropriate understanding of the stakeholders who constitute the pertinent interorganizational community (Swanson and Ramiller, 1997) and who play key roles in activities related to both sensegiving and sensemaking during GDSN standard adoption. Specifically, we asked the key informant for her insights about the ideal sampling approach for answering our research question.

Initially, we selected twelve appropriate informants who worked for the focal retailer (as did the key informant). These informants served key functions with regard to GDSN adoption by the retailer, as exemplified by their titles, such as Project Organization & B2B Manager, Manager of the IS & Organization Department, Organization Manager, Project Manager, and Director of the GDS/Project.

Because GDSN adoption involves not single actor but rather the interorganizational community (Swanson and Ramiller, 1997), we next worked with the key informant to pinpoint all stakeholders, throughout the pertinent interorganizational community, who performed sensegiving and sensegiving missions in the French retail industry. Consequently, we identified four other groups of informants for inclusion:

1. Standard organization setters (GS1). We interviewed the General Director France, the Innovation and Technologies Director, the Synchronization Projects Technical Manager and the Strategic Marketing Director.
2. General European Manager of the Global Commerce Initiative (GCI) and the two main interlocutors from key data pools (Industry Relations Director at 1 sync, Business Development Manager, Western Europe, at SA2),
3. Nine main interlocutors of primary IT providers whose synchronization initiatives have been certified by GS1 (Local Catalog Providers),
4. Seven key interlocutors who have managed the process of GDSN standard adoption from the top six French retailers,
5. Twenty-five representatives of the supplying community, notably from companies such as L'Oreal, Procter & Gamble, Kraft Foods, Coca-Cola, Nestlé, Unilever, Palmolive, Cadbury, and Beiersdorf.

In accordance with the key informant's perspective and GS1, these interlocutors constitute the most appropriate informants, interviews are the best forms of access to their interpretations of actions and events (Walsham, 1993). To ensure the validity of the sample, we also paid specific attention to reaching theoretical saturation before halting the data collection (i.e., additional interviews added nothing new to our knowledge). In total, we conducted 59 interviews, which an average interview duration of 45 minutes.

[6] EAN became GS1 in 2005.

We provided the interview transcripts to the respondents to obtain their permission to use the revealed information. From these detailed interviews, we gathered 818 transcript pages. In addition, we used alternative information sources, such as meetings with key informants, business reports, and published business reports of the GDSN standard. The qualitative data analysis was informed by insights from grounded theory (Glaser and Strauss, 1967); the coding techniques were those proposed by Strauss and Corbin (1998) and exemplified by Orlikowksi (1993). That is, to code the qualitative data, we began with open coding techniques and assigned first-order concepts to the verbatim excerpts (Strauss and Corbin, 1998). Following a line-by-line reading, we employed an iterative process to ascertain the main ideas and label all phenomena in the data by consolidating them into generic and meaningful categories that also matched our theoretical sensegiving/sensemaking framework.

3. Preliminary Result

Because the analysis of our data is ongoing, we highlight some instances amongst our results. Thus, different retailers engaged in different sense making activities about the best adoption approach leading to different operational synchronization enabled-technologies (Peer to Peer versus GDSN). P2P solutions were promoted by some retailers to foster data synchronization adoption by creating a critical mass

"*PtoP is not GDSN but [is] another quick and tactical solution in order to quickly embark all the suppliers*" (Standard and knowledge manager, Retailer)

By doing so, suppliers face different options to synchronize their data. They can either do it through the network or P2P solutions. This multiplicity of data synchronization options creates interrogations on the best way to do it. This is particularly true since P2P solutions are easier to implement. Thus suppliers don't really understand the opportunity to synchronize data through the network (GDSN) when they can do it in an easier way by adopting P2P solutions.

"*… PtoP solutions are harmful to the adoption of the network: one may wonder why they should adopt GDSN when they can do it through PtoP solutions*…" (Retailer)

This different synchronization sensegiving toward the same suppliers' community thus hinders GDSN adoption. Indeed,when some retailers have called for the adoption of the GDSN standard, others have broken this sense (Vlaar, van Feneam and Tiwari, 2008) by calling for the adoption of Peer to Peer synchronization technology leading thus to problems of understanding (Vlaar, Van den Bosch and Volberda. 2006) within the interorganizational community (Swanson and Ramiller, 1997). Basically, Vlaar et al. (2006) conceptualized that problems of understanding in interorganizational relationships "*lead participants to interpret and understand the same phenomena differently*" (p. 1621) and explain that they are caused by actors' discrepancies in terms of cognitive frames (Nooteboom 1992), terminologies (Kaghan and Lounsbury 2006) and philosophies (Lane and Lubatkin 1998). In line with Vlaar and his colleagues (2006) conceptualization of problems of understanding in interorganizational relationships, we contend that such problems did exist between the different organizational actors composing the interorganizational community (Swanson and Ramiller, 1997) during the adoption endeavor of the GDSN standard. In our context, these problems of understandings have caused ambiguity, and misinterpretations that troubled the effective adoption of the GDSN standard supporting the classic painful adoption of technological innovations (Attewel, 1992). These problems are reinforced by technical problems which further complicated GDSN adoption. Our results emphasize technical problems which encourage suppliers to adopt P2P solutions rather than GDSN.

"*…I have noticed that many actors still prefer P2P solutions because they think they better master confidentiality. I assume that GDSN implies important stakes and we are in a period in which people prefer waiting a little bit*…"(IT provider)

This policy of P2P synchronization was encouraged by IT providers who, seeing the GDSN as a disruptive technology (Bower and Christensen, 1995), were willing to keep their proprietary solutions (West, 2007) in a way that safeguard their advantage in the Peer to Peer technology by interpreting the standard as a threat to their competitive interest (Markus et al. 2006).

Suppliers underline security concerns and confidentiality issues raised by the network. They, then, bypass the network for certain sensitive information such as price and promotion and prefer to send this information through P2P solutions.

By promoting P2P solutions, the interorganizational community creates a "window of opportunity" (Tyre and Orlikowski, 1994) to reconsider the best way to synchronize data. However, the absence of consensus on the way to synchronize as well as the inconsistency of the message driven by the interorganizational community complicates the sense making and hinders GDSN adoption. This is particularly true since the technology is new and subject to technical and confidentiality problems. Thus, P2P solutions were interpreted as a solution to cope with these technical and confidentiality concerns. By doing so, suppliers were able to make their own sense making of the best way to synchronize data. It is worth noting that while the adoption of P2P solutions was justified by technical as well as confidentiality issues, their coexistence with the network may raise questions about its impact on data quality. Retailers and suppliers have to deal with data which were exchanged through different systems which require additional processing of data.

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