

Supplier Visibility: Important Relationship-Specific Capability for Buying Firms

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Abstract

Obtaining visibility into key suppliers is considered of utmost importance for manufacturers. However, the term supplier visibility has been underdeveloped. For better future studies and application of the concept, we need to clarify it theoretically and practically. This paper endeavors to fill in the gap by providing a conceptualization of supplier visibility which is built on extant theories. Specifically, our literature review on this concept has shown that the term has usually been used interchangeably with other concepts such as information sharing. We stress, however, that to be qualified for supplier visibility, the concept needs to take information sharing as a prerequisite, but goes beyond it and requires the efficacy conditions. Moreover, as suggested by extant theories, supplier visibility may be multi-dimensional. Thus, we conceptualize supplier visibility as the degree to which a focal buying firm is able to access timely, accurate, and relevant information about its supplier's operational and strategic issues. To illustrate the working of the concept in practice, a case study in the automotive industry contrasting the approaches used by the U.S. and Japanese manufacturers is presented. Directions are also recommended for future studies.

Keywords: Visibility, transparency, relational rent, resource-based view, supply chain management.

1. Introduction

Obtaining visibility into a key supplier is considered to be of utmost importance for supply chain managers in manufacturing firms. This is because, on the one hand, a typical manufacturer today is more in “the assembling business than in the business of producing the components required to create the end product” (Joshi, 2009). On the other hand, the failure rates of suppliers have suddenly swung up by 30% recently, probably due to the current economic crisis, and have not seemed to reach the top (McKinsey & Company Operations Extranet, 2010). Manufacturing firms, therefore, are facing prominent and increasing disruption risks in supply. To deal with the risks, a manufacturer may not want to buy insurance or take full control of the suppliers via vertical integration, because such approaches are usually too costly or even are not feasible. Obtaining visibility into a key supplier thus could be the only efficient and effective way for manufacturers, because it could help the firms to proactively devise the necessary methods to deal with the risks.

In an internal memo to employees in 2008, Jim McNerney, CEO of Boeing, stressed: “I think having real-time visibility of your partner’s inventory as they are assembling things to give a global understanding of how things are coming together all the way down to Tier 3 and 4 would have helped us a lot. So too would IT visibility, as we had on the engineering side.” What he really meant by “visibility”, however, is not clearly defined.

This is also the case in supply chain management where visibility has become a popular buzzword. In fact, however, the term ‘visibili-

ty’ remains elusive, especially in the supply chain literature (Barratt and Oke, 2007) or at least, there exist many definitions for the concept (Caridi, Crippa et al., 2010). Recently, researchers have been calling for a better understanding of the concept (e.g. Wang and Wei, 2007) and untangling its workings in practice (e.g. Straub, Hoffman et al., 2002; Wang and Wei, 2007). There have been also some attempts to clarify and measure visibility at the supply chain level (e.g. Caridi, Crippa et al., 2010). At a relationship level, however, visibility has usually been used interchangeably with other popular notions such as information sharing (Swaminathan and Tayur, 2003; Barratt and Oke, 2007). Thus there is an urgent need for a better understanding and clear conceptualization of supplier visibility for its inclusion in future studies.

Besides the conceptualization problem, most studies in the extant literature have considered visibility and its related concepts, including information sharing and transparency, as a unidimensional or global construct. Such treatment may be problematic because it could result in loss of information. For example, when the components of a construct are distinctive they should have different antecedents and/or outcomes. Combining the components into a global construct may cause the prominent relationships with their antecedents and outcomes to be insignificant. Wareham et al., (2005) and Hultman and Axelsson (2007) are the only exceptions, to the best of our knowledge, which have proposed to dimensionalize the constructs. The work by Wareham et al. (2005), however, focused on the supply chain level. Moreover, on the one

hand, the work by Hultman and Axelsson built a taxonomy of transparency only based on a few case studies (cf. Hultman and Axelsson, 2007). The work by Wareham et al. (2005), on the other hand, only proposed a typology for information sharing at the supply chain level without providing empirical evidence. Thus if we take a perspective of a manufacturer in a relationship with a supplier (i.e. relationship level), there is a need for a relationship-specific dimensionalization of visibility, which is built on extant theories. Thus, our research question for this paper is: What is supplier visibility? And based on extant theories, could be it dimensionalized for empirical testing?

This paper, therefore, aims to make at least two contributions to the literature. First, we will provide a better understanding of the supplier visibility concept. Specifically, we will discuss supplier visibility which is built on an emerging concept of transparency (Lamming, Caldwell et al., 2001; Lamming, Caldwell et al., 2004; Lamming, Caldwell et al., 2005; Bartlett, Julien et al., 2007) and goes beyond, taking information sharing as a baseline prerequisite. In our discussion, a buyer's visibility into its supplier (hereafter supplier visibility or visibility) is referred to the degree to which a focal buying firm is able to access timely, accurate, and relevant information about its supplier's operational and strategic issues. The unit of analysis, therefore, is at the relationship level. Second, as could be seen in the definition, we propose two potentially distinctive dimensions of supplier visibility, namely strategic and operational supplier visibility. Our contention is that while both could be important, they are distinctive because they

may have different antecedents. With a particular supplier, a manufacturing firm may have strategic and operational visibility of different degrees. We admit, however, such a distinction may be subject to empirical evidence.

The rest of the paper will be organized as follows. First, we will provide the theoretical background for supplier visibility. Based on the literature review, we point out the importance of the concept as well as the gap in the extant literature. Next, we propose our concept of supplier visibility, its attributes, and possible components. To provide some initial evidence then, we provide a case study in the automotive industry to illustrate the working of the supplier visibility construct and its components as proposed.

2. Visibility: theories and conceptualization

Literature on visibility has seemed to start with the notion of information sharing which can be understood as the degree to which information is available or exchanged within a distribution or supply network (e.g. Gustin, Daugherty et al., 1995) or in a dyad (e.g. Noordewier, John et al., 1990). Along the testing process, however, researchers have recognized the limitation of such a notion because the availability of such information itself is not enough. Partners in a relationship or supply chain require the information to be accessible in an efficacious manner (e.g. Lamming, Caldwell et al., 2001; Wu, Yenyurt et al., 2006). Only under such circumstances should visibility provide benefits for the partners. Visibility then can be understood differently as "formal and informal sharing of meaningful and timely information between firms" (Anderson and Narus, 1990). Sometimes, the

notion even already implied higher values or performance for the partners when it was defined as “the creation, nurture, and delivery of value, for the benefit, and thus continued existence, of both parties” (Lamming, Caldwell et al., 2004).

Table 1 in the Appendix provides a summary of the representative articles that have examined information sharing and visibility. It should be noted that most empirical studies to date have been dealing with the concept of information sharing. Only recent theoretical advances have discussed the concept of visibility at the relationship level (Lamming, Caldwell et al., 2001; Lamming, Caldwell et al., 2004; Lamming, Caldwell et al., 2005) but empirical evidence has not shed much light on the concept. To develop the concept of supplier visibility and distinguish it from information sharing, we can first take a look at the theories behind the notions.

2.1. Theories related to supplier visibility

Two streams of research with their theoretical perspectives are particularly applicable to the concept of supplier visibility here. In particular, one line of research has focused on the outcomes of supplier visibility. In the second, antecedents to supplier visibility can be explored.

2.1.1. The outcome side of visibility

On the outcome side, sharing information among partners has long been recognized as an important part of prominent theories for dyadic relationships. Typical theories include agency theories (Eisenhardt, 1989; Bergen, Dutta et al., 1992), dependence theory (Pfeffer and Salancik, 1978), and relational rent theory

(Dyer and Singh, 1998).

First, one of the key contexts for information exchange is in agent/principal relationship where lack of information sharing results in the so-called agency problems (see Eisenhardt 1989 for a review). Agency problems arise when a principal delegates her interests to an agent, exposing herself to opportunistic behavior of the agent due to their goal incongruence and information asymmetry. Examples of these problems are adverse selection and moral hazard. Under the information imbalance, moral hazard occurs when the agent does not put forth the agreed-upon effort to meet the principal's demand. Adverse selection, on the other hand, refers to the misrepresentation of the agent's ability to meet the principal's requirements at the time of hiring or when the agent is working (cf. Eisenhardt, 1989). With either problem, a suggested solution would be for the principal to gain access to information about the agent, and thus reduce such information-asymmetry problems.

Likewise, dependence theory implicitly recognizes the importance of sharing information to coordinate parties' activities. A firm may depend on its partner because it cannot control all of the necessary conditions to obtain desired outcomes (Pfeffer and Salancik, 1978). Even though not explicitly discussed in dependence theory, sharing information can be considered instrumental in reducing interdependence problems by facilitating parties to coordinate activities properly.

The third theory that stresses the important outcomes of information sharing is the relational rent (Dyer and Singh, 1998). Under this theory, exchanging knowledge and informa-

tion among partners is considered to be critical to obtain relational competitive advantages (i.e. relational rents). As such, firms may want to move away from market relationships to create alliances with partners, learning from its alliance partners via knowledge sharing routines to generate the rents (Dyer and Singh, 1998). Knowledge and information sharing, therefore, are critical for firms to create relational rents, the rents that are accrued only to partners in a relationship beyond the ones that any firm could obtain alone.

In fact, the relational view could be considered an extension of the resource-based view (Barney, 1991). Under this view, any resources of a firm that meet the requirements of being valuable, rare, imperfectly imitable, and have no strategically equivalent substitutes, could have the potential to give rise to the firm's competitive advantage. Here access to information that is valuable from its exchange partners, therefore, could result in competitive advantage (Wu, Yenyurt et al., 2006). Different from the resource-based view, however, the relational rent theory emphasizes the resources that are relationship-specific rather than those that are internal to the firm (Dyer and Singh, 1998). Thus the ability to access the valuable information from its partner is qualified for the advantage-rising resource because of the relationship that the firm has with its partner. For this nature of relationship specificity, such ability is usually valuable and rare, and could not be imitated easily in other relationships (Dyer and Singh, 1998).

In short, theories in the literature seem to converge on the idea that information sharing among partners should be an important rela-

tionship-specific capability for a buying firm. Sharing information thus may result in better competitive advantage for the firm. Empirical evidence in the supply chain context, however, has shown that information sharing alone does not always result in better performance. Other conditions are also required such as the coordination between the partners (Sahin and Robinson, 2002). The concept of supplier visibility thus should only take information sharing as the baseline and include other necessary conditions.

2.1.2. Antecedent side of visibility

Under the second stream of research, theorists have focused on the obstacles to information sharing which may be rooted from the nature of this special good, the information. Contrary to the perspective of neoclassical economics, this stream of research started with the assumption that information is imperfect and access to information is limited and costly in the real world (Stiglitz, 2000). Thus many of the classical economic results require adjustments (Stiglitz, 2000). In particular, when the simplifying assumption of perfect information is removed, the economic treatment and analysis of information becomes formidable. Such a challenge starts from the non-tradable nature of information that in turn makes it hard to be priced in the market. Unlike other goods, information presents many characteristics of public goods as non-exclusive and non-rivalrous. That means it is usually difficult to exclude others from the benefits of the information and it is not depletable with use (Stiglitz, 2000). Under these conditions the marginal cost of information approaches zero with which the free riding problem arises.

Moreover information sharing is irreversible because when information is shared, it cannot be taken back (Lamming, Caldwell et al., 2004; Lamming, Caldwell et al., 2005). These complications present big challenges in analyzing appropriation of returns to investment in information and knowledge (Stiglitz, 2000) and the motivation for one to share information with others. Thus this stream of research has pointed to the challenges in transferring knowledge and information and thus the cost side of gaining access to information.

Under such assumptions, the knowledge transfer perspective (Von Hippel, 1994; Szulanski, 1996) has examined different antecedents to knowledge/information transferring. In particular, this perspective centers around the notion of information stickiness which connotes the difficulty of transferring knowledge/information. Under this perspective, because it is difficult or costly to transfer knowledge, the theorists have identified four sets of factors that may influence the success of knowledge transfer including (1) information characteristics, (2) sender's characteristics, (3) receiver's characteristics, and (4) the context characteristics.

In short, this stream of research has pointed to the challenges in transferring knowledge and information among trading partners. Moreover, the success of such transfer should be relationship-specific and therefore will be affected by factors surrounding the relationship between a buyer and a supplier. The concept of supplier visibility therefore should be developed by taking into account the specific context of a relationship between a buyer and a supplier.

2.2. Gaps in vertical inter-organizational studies related to supplier visibility

Thus by examining the extant streams of research in an inter-organizational context, two general patterns stand out. First, while recent studies have recognized the importance of sharing information (e.g. McEvily and Marcus, 2005; Wareham, Mathiassen et al., 2005; Frazier, Maltz et al., 2009; Klein and Rai, 2009) their focus was usually on the presence of information flows or availability rather than the efficacy of such flows. While the presence of a flow of information is the necessary condition, the usefulness of the information shared may also depend more on its content qualities that drive the durable effects on performance outcomes. As such, the effect of information flows on performance outcome variables were sometimes found indirect and mediated by information efficacy (e.g. Mohr and Sohi, 1995; Barratt and Oke, 2007). We contend that these features (i.e. the information efficacy) that direct effect on outcomes and strategic value, distinguish visibility from the usually-used concept of information sharing.

Second, most of the articles in the literature have measured information sharing or visibility by tapping into specific types of information (e.g. Noordewier, John et al., 1990; Gustin, Daugherty et al., 1995; Lee, Padmanabhan et al., 1997; Sahin and Robinson, 2002; Lee, Padmanabhan et al., 2004; Sahin and Robinson, 2005; Barratt and Oke, 2007; Wang and Wei, 2007; Zhou and Benton Jr, 2007). Others did not make clear the types of information they examined (e.g. Heide and Miner, 1992; Bello, Chelariu et al., 2003; McEvily

and Marcus, 2005; Griffith, Myers et al., 2006; Wu, Yenyurt et al., 2006). Wareham et al. (2005) could be the only exception, to the best of our knowledge, who made a distinction between strategic and operational information theoretically¹. The authors argued that sharing strategic and operational information may result in differential outcomes for a supply network. While sharing the former could lead to higher market performance in terms of superior customer satisfaction, loyalty, service level, and the resulting revenue growth, sharing the latter could help reduce errors and obtain operational performance in terms of lower operation costs (Wareha, Mathiassen et al., 2005). Concurring with this view, our contention is that the two types of information can be distinguished, and even though both are important, different mechanisms may be required for obtaining each type.

2.3. Supplier visibility: attributes and potential components

For a better concept of visibility, its attributes are key questions in its definition. Among those, information sharing and efficacy require special attention. Here we explore these attributes as part of the development of visibility construct.

2.3.1. Information sharing as a baseline prerequisite

The supplier visibility concept in this paper benefits from the earlier discussion and requires information sharing as a baseline prerequisite. In order for a firm to have visibility, information and knowledge need to be shared or obtained from the firm's external sources. It should be noted that the concept of visibility here does not focus on the mechanistic flows

of information sharing but the outcome of such flows, which is the access that the firm has to its partner's information. Thus we will not consider the flow characteristics in the mechanistic view (Mohr and Nevin, 1990; Mohr, Fisher et al., 1999) but stress the degree of access that a firm has to its partner's information. Even though important, the flows of information from a trading partner cannot determine the access to the partner's information (Frishammar and Sven Åke, 2005; Frazier, Maltz et al., 2009).

2.3.2. Information efficacy as an attribute of visibility

Another attribute in the literature that underlines and sometimes supplants visibility is information efficacy. The attribute has been discussed in a recent concept of transparency in several works by Lamming and his co-authors (e.g. Lamming, Caldwell et al., 2001; Lamming, Caldwell et al., 2004; Lamming, Caldwell et al., 2005) and is defined as "the creation, nurture, and delivery of value, for the benefit, and thus continued existence, of both parties" (Lamming, Caldwell et al., 2001). Transparency development therefore, is concerned with the exchange of many different and valuable intangibles including "know-how, cost information, operational data, and strategic intent" (Lamming, Caldwell et al., 2004).

The critical point that makes transparency distinct from information sharing is the requirement for information efficacy. Thus, transparency does not assume perfect access to information and knowledge. In fact, perfect clarity may never exist, and too much information may limit transparency (Lamming,

Caldwell et al., 2004). Empirical evidence already shows that too much information may lead to the problem of information overload (e.g. Gosain, Malhotra et al., 2004). Transparency, therefore, requires that the partners exchange only the relevant information which, and more importantly, is needed for mutual benefits. The mutual benefits here are considered within the realm of the partners' abilities to create, nurture, and deliver value for their customers. The focus then is not on costs but value, because reducing costs does not always come along with better benefits (Lamming, Caldwell et al., 2001).

It should be noted however, that the discussion of transparency seems to include in itself the notion of competitive advantage, which has long been recognized as the outcome of resources or capabilities. We therefore focus on the efficacy of the information accessed rather than the outcome of visibility in developing the concept of supplier visibility.

For these above reasons, we posit that for partners to obtain benefits from information and knowledge shared, supplier visibility requires information/knowledge to be both potentially accessible and content-wise efficacious. Various dimensions of information efficacy have been identified in the literature including accuracy, currency, meaningfulness, timeliness, relevance, reliability, credibility, adequacy, completeness, and usefulness (Gustin, Daugherty et al., 1995; Mohr and Sohi, 1995; Bello, Chelariu et al., 2003; Hult, Ketchen et al., 2006; Kaipia and Hartiala, 2006; Kim, Cavusgil et al., 2006; Barratt and Oke, 2007; Wang and Wei, 2007). We propose that at least three popular dimensions of infor-

mation efficacy should always be examined when considering visibility, including timeliness, relevance, and accuracy. These dimensions have usually been evoked by various researchers in inter-organizational studies and are relatively easily discernable by business managers.

2.3.3. *Strategic versus operational visibility*

Different from most concepts of information sharing and visibility in the literature, we posit that visibility could be a multi-component construct. In another word, in a relationship with a partner, a firm may have different types of visibilities to different extents. This argument is in line with one of the most critical arguments about transparency in several works by Lamming and his co-authors (e.g. Lamming, Caldwell et al., 2001; Lamming, Caldwell et al., 2004; Lamming, Caldwell et al., 2005). As argued by the authors, transparency does not necessarily mean permanent or full transparency or the transparency of the entire relationship (Lamming, Caldwell et al., 2001; Hultman and Axelsson, 2007). Instead, in one relationship, there may exist different degrees of transparency in different elements, with some aspects transparent, whilst others may be only translucent or opaque (Lamming, Caldwell et al., 2001; Lamming, Caldwell et al., 2004; Lamming, Caldwell et al., 2005). It has been suggested therefore, that there could be a typology of transparency with different and separate types of transparency (e.g. Hultman and Axelsson, 2007). Similarly, we argue that there may be different components of supplier visibility.

Drawing from the literature on information type in buyer-seller relationship (Seidmann

and Sundararajan, 1997; Wareham, Mathiassen et al., 2005; Klein and Rai, 2009), we make a distinction between strategic and operational supplier visibility based on the types of information accessed accordingly. These two different types of information seem to be distinguishable and agreeable among researchers in buyer-seller relationships. For example, information exchanged between a buyer and seller could be classified into four categories including (1) order or transactional, (2) operational, (3) strategic, and (4) strategic/competitive (Seidmann and Sundararajan, 1997; Klein and Rai, 2009). The first two categories of information pertain to the process of deploying input resources to produce products and services including production, capacity, and inventory schedules and plans that have been examined in the literature (e.g. Noordewier, John et al., 1990; Wang and Wei, 2007; Klein and Rai, 2009) for which we term operational information. The last two categories pertain to information which is more sensitive and has implications for long-range decision making, (Wareham, Mathiassen et al., 2005; Frazier, Maltz et al., 2009) which we term strategic information. Examples of such strategic information examined in the literature include cost structure and margins (e.g. Lamming, Caldwell et al., 2001; Lamming, Caldwell et al., 2004; Lamming, Caldwell et al., 2005; Klein and Rai, 2009), firm competitive positioning, and planned actions in the market (e.g. Klein and Rai, 2009). Thus on the one hand, operational information includes data that can be related to a specific process or transaction pertinent to the planning and execution of operations. Strategic information, on

the other hand, is usually characterized by a longer term perspective and could span cognition about the external environment, scarce and valuable resources, and other capabilities (Wareham, Mathiassen et al., 2005).

Another theoretical reason for the distinction between operational and strategic information is the degree of tacitness and complexity of the information. In order for parties to obtain mutual benefits, both types of information are needed to be exchanged for partners to reduce non-value added activities and maximize potential values for the relationship (Lamming, Caldwell et al., 2005; Wareham, Mathiassen et al., 2005). However, obtaining access to strategic information may be harder than the operational information. The reason is as strategic information usually concerns a longer temporal perspective, it should be more abstract and harder to codify, compared to the operational one. Moreover, the strategic information will concern not only a firm's internal position but the firm's position with regard to its external environment, scarce and valuable resources and capabilities. Such information therefore will be usually more complex and more difficult to interpret. Strategic information thus is more tacit and more difficult to teach, making it harder to be transferred (Kogut and Zander, 1992; Nonaka, 1994), compared to the operational information.

We have to admit, however, that though two types of information can be used in managerial decision making in different manners, "the difference between the two is often a function of aggregation where operational data can be combined to form strategic data" (Wareham, Mathiassen et al., 2005). Thus, the distinction

between the two may not be easily discernable by practicing managers. Therefore, such distinction and the resulting distinction between operational and strategic visibility will also need to be supported by empirical evidence to be useful and generalizable.

2.3.4. Supplier visibility as relationship-specific capability

Based on the above discussions it could be inferred that supplier visibility can be examined under the resource-based view. Under the view, the valuable resources for a firm that can result in higher competitive advantage may include “all assets, capabilities, organizational processes, firm attributes, information, knowledge, etc. controlled by a firm...” (Barney, 1991). The concept of supplier visibility here refers to the ability to access the information from a supplier and thus may be qualified as an important capability.

This is because supplier visibility, especially the strategic visibility, could qualify for the requirements of being valuable, rare, imperfectly imitable, and having no strategically equivalent substitutes (Barney, 1991). First, visibility is valuable because the ability to access the needed information from a key supplier is costly to develop. Transferring complex and abstract information is especially sticky (von Hippel, 1994; Szulanski, 1996). However, when developed supplier visibility could help a manufacturing firm reduce the non-added-value activities, resulting in high performance for the firm (Lamming, Caldwell et al., 2004). Second, supplier visibility is rare because the information about supplier’s strategic and operational issues is usually proprietary (Lamming, Caldwell et al., 2001;

Lamming, Caldwell et al., 2004; Lamming, Caldwell et al., 2005). This is especially true for the strategic information, which is so sensitive that a supplier may never want to disclose if it is not necessary, because it may expose the supplier to potential opportunism by its manufacturer (Lamming, Caldwell et al., 2004; Lamming, Caldwell et al., 2005). Thus the ability to access the information cannot be surely developed under any relationships that a firm has. Third, visibility into a key supplier is relationship-specific by definition and therefore can be difficult to imitate. At least, replicating a relationship requires time and effort (Dyer and Singh, 1998).

The final requirement of non-substitutability is harder to qualify and has not been discussed in earlier works. In other words, we raise the question: Can supplier visibility be substitutable? For a relationship between a buyer and a supplier, two candidates for the substitution of supplier visibility can be identified in the literature: integration and insurance. First, when a firm does not have visibility into its partner, it may be better to integrate with the partner (Williamson, 1991). However, vertical integration is usually costly and sometimes not feasible especially with regard to foreign partners. Such integration entails not only acquisition costs but also the effort to make the integration work. Second, facing with uncertainty over a supply (i.e. no supplier visibility), a buying firm may want to buy insurance for a certain outcome. In the supply chain context, however, insurance premiums are usually so preventively high that they are rarely used by any buying firms. Moreover, even though a firm could avoid disruption to its supply finan-

cially by buying insurance, it may not protect the firm from losing customers (Tang, 2006). Thus with regard to a particular relationship, both options here may not be perfectly substitutable for supplier visibility. In other words, supplier visibility may be non-substitutable unless firms have the option of dropping the important relationships. We acknowledge that, however, the non-substitutability of supplier visibility may be an empirical matter and empirical evidence will be needed to shed light on this. Still, we contend that supplier visibility is very likely to be qualified for all the requirements to become the capability for firms to obtain competitive advantages.

It should be noted that, however, our view on supplier visibility here is different from the original concept of resource or capability in the resource-based view. In fact, the original view limited such resources to the ones that a firm can control (see Barney, 1991). Our concept of supplier visibility here, however, may not be controlled by a firm but a relationship that the firm has with its supplier.

In summary, supplier visibility in this paper includes two key attributes: the accessibility of supplier information by a buyer and the efficacy of the information obtained. The information will include not only the operational but also the strategic information. Thus, in a buyer-seller relationship, a buying focal firm may have operational and strategic visibility into its supplier to different extents. Visibility into a key supplier could be an important relationship-specific capability that if obtained by a buying firm could result in its competitive advantage.

3. Case study: U.S. versus Japan automotive industry

3.1. Methodology

Case study is a qualitative research strategy, which is more appropriate for new or explorative research. This is because qualitative research empirically explores relationship using textual rather than quantitative data (Miles and Huberman, 1994). Such method supports explanations that are complex, nuanced, and detailed (Mason, 2002). Thus, the method may be suitable for the research like ours when the concept of supplier visibility is just being explored and developed from extant theories.

To provide some empirical evidence on the working of supplier visibility concept, in this section, we provide an illustrative case contrasting the results of having versus not having visibility into suppliers in automotive industry. This is a typical and traditional case which has been used in previous studies. We review the case with the emphasis on our concept of supplier visibility as the important capability. In this case, we interweave the details of what happened with discussions of supplier visibility and its components.

3.2. The case study

The automotive industry in the U.S. represents a traditional case to demonstrate the importance of obtaining visibility into suppliers. The big three U.S. automakers (GM, Ford, and Chrysler) used to dominate the market with 60% to 70% market share in the 1990s. The market share of the big three, however, has been reduced to below 50% in 2007 and the domination could be said to officially cease

with GM filing for chapter 11 in 2009. Even though both U.S. and foreign automakers have long depended on their suppliers for most components for their vehicles, the contrasting success and failure of Japan versus U.S. automakers has been driven by their approaches, and the resulting visibility, to manage their suppliers properly.

In fact, automotive supplier networks are inherently complex and often involve many different international borders. The industry has usually been characterized by a long product development process, followed by complex manufacturing stages, which involve different types and tiers of suppliers. For example, General Motors in 2000 had to deal with multiple brands, 150 web sites, 63 call centers, 23 different databases, and about 12,000 suppliers who shipped daily almost two hundreds millions pounds of materials from all over the world (Koudal, Lee et al., 2003). However, such complexity in the supplier base is not solely created by the industry nature, but mostly caused by the approach to deal with suppliers by the U.S. automakers.

3.3. The U.S. automaker approach: no visibility

As recorded in the literature, U.S. companies have often maintained an arm's-length relationship with their suppliers (Dyer and Singh, 1998). The suppliers were usually required to bid against each other every year and the selection then would be based solely on costs. Thus, not only was the relationship between U.S. automakers and their suppliers often adversarial with complex written contracts and accusations, but the number of suppliers that a U.S. firm had to deal with was also

significantly large and too complex to handle.

These arm's-length relationships, even though they could provide the U.S. automakers with certain savings in terms of parts costs, led to a very low or even non-existent visibility of the U.S. auto makers into their suppliers. For example, communication between GM and its suppliers was often manual via fax, phone, modem, or electronic spreadsheet. While electronic data interchange (EDI) has been long utilized in the U.S. auto industry, many small suppliers of GM remained out of the loop because they were not technologically advanced and could not afford huge investments in EDI (Koudal, Lee et al., 2003). Similarly, Chrysler followed the same approach in dealing with its suppliers and thus had very limited visibility into the suppliers. This can be demonstrated ironically by the fact that, in 2005, Chrysler brought Lear, one of its suppliers, to court for not observing the contracted prices, even though Lear posted a net loss of nearly USD 600 millions in the fourth quarter of 2005. This provides a clear and striking example of Chrysler not having strategic visibility into its key suppliers.

It should be noted that the U.S. industry has long been utilizing electronic applications (first EDI and then web-based) to communicate with suppliers about logistics issues. Thus, except for the suppliers that are out of the loop, to some extent, the manufacturers may have operational visibility into the suppliers. We are not sure, however, how efficacious the information that they have access is to the suppliers.

It should also be noted that such a lack of visibility is both the direct and indirect result

of the arm's-length relationship approach via having too many suppliers. On the one hand, the focus of this approach is obviously about cost reduction rather than efficient communication. On the other hand, too many suppliers make it harder to coordinate the whole network and obtain visibility into each supplier. As a result, compared to their foreign counterparts, the U.S. automakers usually had long scheduling lead times and unreliable production, which in turn led to excessive inventories throughout the whole supply chains. Lack of supplier visibility across the chains caused further scheduling delays and short-term production changes, which drove all the partners to build up a buffering inventory. For example, GM used to have a daily production of 35,000 cars shipped to 12,500 dealers worldwide. Lack of communication between logistics suppliers, however, led to unreliable order fulfillment lead times which ranged from two to three months. The changing base of 12,000 suppliers globally also made GM's visibility into inventory levels at different locations a challenging job (Koudal, Lee et al., 2003). Thus, even though the automaker has recently recognized the problems and tried to utilize and leverage the power of the Internet and ecommerce, the results do not seem to be very promising. It can be inferred from these results that operational supplier visibility for the manufacturers is also low. The operational information may be there, but how the automakers access it in an efficacious manner is another matter.

3.4. The Japanese automaker approach: high visibility

In contrast, the success of Japanese automakers has often been attributed to their different approaches in managing the supplier networks. The Japanese automakers usually operate under the concept of Keiretsu with a relatively smaller network of closely related vendors that continuously improve and exchange information for learning. This same concept has been applied for the Japanese companies in the U.S. market as they locally manufactured and sourced their productions in the market. So even though they partnered with the same suppliers of the big three U.S. auto makers, their relationships with the suppliers have usually been raved about, rather than decried, as with the U.S. counterparts (Netessine, 2009).

Several key principles applied by the Japanese automakers in dealing with their suppliers that contrast their approaches to those of the U.S. counterparts can be highlighted (see Netessine 2009). First, Toyota, for example, tries to learn every part of its suppliers before making serious commitments. Usually, its managers will be placed in a potential supplier's business and investments will be made to collect and exchange information before the supplier will be used. Small orders will be placed first with the quality and compliance being observed before more and larger orders will be assigned. The manufacturer then can understand the suppliers' cost structure and

other knowledge to make sure they will have comfortable profit margins. Thus, it can be concluded that Toyota has high strategic visibility into its suppliers even before they commit to using the suppliers.

Second, Japanese automakers keep exchanging information and knowledge with their suppliers in a constant manner. In fact, Toyota and Honda do not specify the exact requirement for auto parts but their suppliers will need to be innovative and figure out what is needed via the communication and knowledge exchange processes with the manufacturers. Such an approach, thus, not only turns the suppliers into active participants rather than just providers, but also helps the manufacturers have constant access to the knowledge and capabilities bases of the suppliers. Such strategic visibility, in turn, will help the Japanese manufacturers to be able to be efficiently selective with regard to which parts should be designed entirely by the suppliers and what should be done with the manufacturers' collaboration.

Third, the Japanese manufacturers constantly supervise and benchmark their suppliers with feedback and involve top management in mundane problem solving. For example, both Honda and Toyota send monthly scorecards evaluating their suppliers on quality, delivery, performance, incidents, and other issues. They also involve supplier's top executives in the production and delivery processes to make them aware of problems caused by their

actions. This provides constant and timely feedback on operational issues. Thus when doing business with suppliers, the manufacturer has operational visibility into the partners.

Finally, even though there is also multi-sourcing, Japanese automakers tended to work only with two or three suppliers for every subsystem. This approach helped maintain competition and ensure the needed supply. Moreover, the approach also helps avoid excessive transaction costs via reducing numbers of suppliers and therefore facilitates obtaining better operational and strategic visibility into the suppliers.

In short, the contrasting approaches outlined above help to demonstrate why the U.S. and Japanese automakers will have different operational and strategic visibility into their suppliers, which in turn leads to the contrasting results of failure and success. The approach by Japanese automakers seems to be easy to understand and appealing. It is, however, difficult or will take time to develop. We argue that this is because obtaining supplier visibility requires a long process of choosing suppliers as well as the constant exchanging of information between partners. For example, Chrysler tried to emulate the approach and has made significant progress in this direction, but the process stalled after the merger with Daimler (Netessine 2009). Similarly, as discussed above, GM tried to utilize the Internet and ecommerce power, but the results are not promising because gaining visibility may

require more than just an integrated IT system. Visibility into suppliers, therefore, is the capability that is difficult to imitate (and transfer) but the results are fruitful competitive advantages.

4. Conclusion and directions for future research

In this paper, we discussed the concept of supplier visibility. In particular, we conceptualized supplier visibility as a relationship-specific capability of a buying firm in its relationship with a key supplier. Our concept of supplier visibility goes beyond this but takes information sharing as a prerequisite. We argue, however, to qualify as supplier visibility, the efficacy of information should also be paid attention. Moreover, we contend that there may be two distinctive components of supplier visibility, the strategic and operational ones. Both may be important but require different mechanisms for developing.

In the case study, we provided some empirical evidence for the working of the supplier visibility concept. We contrasted the performance of Japanese versus U.S. automakers, corresponding to their visibility (versus lack of visibility) into their suppliers with initial classification of operational and strategic issues.

Evidently, the concept of supplier visibility here should be further validated quantitatively for its usefulness. This paper could be the first step in developing the construct, which could be utilized for the next validation steps. In fact, in a separate working paper, we are developing

scales for the construct and linking them to different antecedents for further validation. Once validated, we hope this construct could be used in future research.

As discussed in this paper, the substitutability of supplier visibility could be an empirical matter. Future research thus could capitalize on this and devise a design to examine if supplier visibility could be substituted by any other capabilities or approaches. Moreover, it is still unclear when supplier visibility will be more important and when it could be substituted by other relationship-specific capabilities.

Future research should also shed light on the antecedents and outcomes of supplier visibility. Specifically, as we argued, there may be different mechanisms for developing strategic versus operational visibility. Moreover, the implication for each component of supplier visibility may be different. As supplier visibility goes beyond but takes information sharing as a prerequisite, it is still unclear if the antecedents and outcomes of information sharing identified in the literature will still hold for supplier visibility.

We hope this theoretical and qualitative piece could provide a better understanding of the important but still-elusive concept: supplier visibility. As this term becomes a buzzword, it is important to include it in our future vertical inter-organizational research.

APPENDIX

Table 1: Representative Articles Examined -- Information Sharing and Visibility

Level of Analysis	Terms/ Aliases of Construct	Efficacy of Information Examined	Content of Information Examined	Definition and Dimensions	Antecedents/ Outcomes	Representative Authors, Year
Information Sharing at Chain/ Network Level	Information availability	No	Operational	The degree to which information is available or exchanged within a distribution system.	Lead to Success of logistic system integration	(Gustin, Daugherty et al. 1995)
	Information Sharing	No	Operational	Information shared among upstream to downstream. The focus is on sharing demand information to upstream partners.	Lead to Lower bullwhip effects	(Lee and Padmanabhan 1997; Lee, admanabhan et al. 1997; Lee, So et al. 2000; Lee, Padmanabhan et al. 2004)
	Information Sharing	N/A	Operational	The timing and specific data shared ranged from only sharing the immediate replenishment order to sharing all POS, inventory, and cost data along the supply chain.	Lead to Higher Supply Chain Performance (reduce costs)	(Sahin and Robinson 2002; Sahin and Robinson 2005)
Visibility at Channel/ Cham/ Network Level	Information Sharing	No	Operational Strategic	The availability of information shared within a network including two separate types: - Strategic information is typically characterized by a longer temporal perspective and is not related to specific process operations. - Operational Information Sharing includes data that can be related to the planning or execution of a specific process or transaction.	Lead to - Market Performance - Operational Performance (respectively)	(Wareham, Mathiassen et al. 2005)
	Information Exchange	Yes	N/A	Formal and informal sharing of meaningful and timely information between firms. Information Exchange is a dimension of Relationalism (MacNeil 1980) and therefore measured at the expectation/norms level.	Anteceded by Manufacturer's dependence and other dyadic antecedents, Leads to Channel Performance	(Anderson and Narus 1990; Heide and John 1992; Bello, Chelariu et al. 2003)

Visibility at Channel/Chain/Network Level (continued)	Information Exchange	No	IT system	Information exchange refers to the ability of a firm to share knowledge with its supply chain partners in an effective and efficient manner. The focus here, however, is on the information system as a whole.	Lead to Marketing and Financial Performance	(Wu, Yenyurt et al. 2006) adapted from (Amit and Schoemaker 1993; Collis 1994; Bharadwaj 2000)
	Information exchange	Yes	IT system	The sharing of knowledge with channel partners to serve downstream customers effectively and efficiently. Such knowledge would include any changes in the business environment, such as market and customer preferences. Dimensions of information exchange include timeliness, accuracy, efficacy, completeness, and credibility of information.	Anteceded by IT System Integration and Advancement Lead to Responsiveness, Coordination, and Market Performance	(Kim, Cavusgil et al. 2006)
	Supply chain visibility	Yes	Operational	The extent to which actors within a supply chain have access to or share information which they consider as key or useful to their operations and which they consider will be of mutual benefit. The information needs to be accurate, trusted, timely, current, useful, and in-a-readily-usable format.	Anteceded by Information Sharing Leads to Enhanced Performance	(Barratt and Oke 2007)
Information Sharing at Relationship Level	Supply Chain Visibility	No	Operational and Strategic	Supply chain visibility has been viewed as the degree to which supply chain partners have access to information related to supply chain operations and management and considered to benefit each other.	Lead to - Capability to configure - Firm performance	(Wei and Wang 2010)
	Information to supplier	N/A	Operational	Information provided to supplier.	Lead to Higher Purchasing performance	(Noordewier, John et al. 1990)
	Monitoring of supplier	No	Operational	N/A	Leads to Higher Purchasing performance	(Noordewier, John et al. 1990)
	Information Sharing	No	Operational Strategic	The degree to which each party discloses information that may facilitate the other party's activities (Heide and Miner 1992).	Leads to Better joint-problem solving and acquisition of competitive capabilities.	(McEvily and Marcus 2005) (Heide and Miner 1992)

Information Sharing at Relationship Level (continued)	Sharing of information	N/A	N/A	The sharing of generalized information about the firm, its product, and its customers	Anteceded by Commitment Lead to Problem Solution	(Griffith, Myers et al. 2006)
	Strategic information flow	No	Strategic	The flow of information from: buyer to supplier supplier to buyer	Anteceded by Focal firm's Trust, Dependence, IT customization Lead to Higher Buyer and Supplier Relationship-specific Performance	(Klein and Rai 2009)
	Distributor Sharing of Strategic Information	No	Strategic	Strategic information is processed and data retained within a distributor organization that has implications for firms' long-range decision-making including external and internal information.	Sharing of strategic internal information is anteceded by Distributor trust, Dependence Asymmetry favoring distributor, Specific investment by distributor and by supplier. Sharing of strategic external information is anteceded by Dependence Asymmetry favoring distributor, Specific investment by distributor and by supplier.	(Frazier, Maltz et al. 2009)
Visibility at Relationship Level	Transparency	Yes	N/A	The creation, nurture, and delivery of value, for the benefit, and thus continued existence, of both parties. Transparency is achieved through two-way exchange of sensitive data for specific purposes of improvements in the dyad itself. Customers usually ask suppliers for information about process factors, largely represented by costs (as proxies for process times, physical space allocation, etc.)	No empirical testing	(Lamming, Caldwell et al. 2001; Lamming, Caldwell et al. 2004; Lamming, Caldwell et al. 2005)

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Notes:

1. Hultman and Axelsson also proposed different types of information to be exchanged between parties. Their taxonomy of transparency, however, is based on their empirical fieldwork rather than on a theoretical background. Hultman, J. and B. Axelsson (2007), 'Towards a Typology of Transparency for Marketing Management Research', *Industrial Marketing Management*, 36(5): 627-635..

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