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Developing a Framework for the Identification and Analysis of the Strategic Resources and Capabilities in Supply Chains

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ABSTRACT

A fundamental challenge in the resource-based view (RBV) research is the identification of strategic resources and capabilities, whether they lie within a firm's boundaries or in its supply chain. RBV theorists regarded the identification of the strategic resources as the first step in the analysis of the resources, followed by development/maintenance of the resources and finally their deployment. Some authors developed frameworks for the analysis of strategic resources within a firm's boundaries. Many believe that a firm's strategic resources and capabilities are not limited to the firm's boundaries, extend its network. In this paper, we classify supply chain resources and capabilities into two categories: internal resources and capabilities (based on RBV) and relational ones (based on RV). We then develop a framework for the identification and analysis of these resources and capabilities and apply it to the supply chain resources and capabilities of two automobile manufacturing companies in Iran.

Keywords: *supply chain, strategic resources and capabilities, sustainable competitive advantage*

1. INTRODUCTION

In some industries, competition is no longer between individual firms, but between supply chains. Identifying the sources of sustainable competitive advantage is one of the most important challenges in strategic management studies, and in the past three decades much research in this area has been done at the organizational level (e.g. Wernerfelt 1984; Barney 1986, 1991; Peteraf 1993; Grant 1991; Dyer and Singh 1998). If we accept that in some industries the unit of competition has changed to supply chain vs. supply chain, the next challenge in strategic management studies is to analyse whole supply chains in order to identify the sources of sustainable competitive advantage.

Are there any sources of sustainable competitive advantage in purchasing and logistics activities? Some authors have examined the subject and concluded that, indeed, purchasing and logistics activities can be a source of competitive advantage (Hult et al. 2002a, b; Wu et al. 2006; Hult et al. 2006; Hult et al. 2003; Lavie 2006; Duschek 2004; Miles and Snow 2007; Ketchen and Hult 2007a, b; Hult et al. 2007a, b; Ramsay 2001; Olavarrieta and Ellinger 1997; Rungtusanatham et al. 2003; Hunt and Davis 2008).

According to the resource-based view (RBV), the most important challenges associated with a firm's resources and capabilities are identifying, developing, protecting, deploying and leveraging them (e.g. Grant 2005; Peteraf 2003; Barney 1991; Amit and Schoemaker 1993). A number of studies have examined how to identify the strategic resources and capabilities within firms (e.gMilles et al. 2003; Deoliveira and Fensterseifer 2003; Hafeez et al. 2002; Carmeli 2004; Hall 1992).

The automotive industry is one context in which we can argue that the unit of competition unit has changed (e.g. Dyer 1997; Dyer 1996; Dyer and Hatch 2004, 2006; Dyer 2000; Dyer and Nobeoka 2000; Dyer et al. 1998; Dyer and Chu 1997, 2000, 2003; Kotabe et al. 2003). The auto industry also has a low industry clock speed (Fine 1998), referring to the speed of innovation, and a very high interdependence between key suppliers and the final assembler (Krause et al., 2007). This makes the automotive supply chain a good context for our research problem, which is to identify and analyse the strategic resources and capabilities in supply chains. In particular, both internal resources and capabilities and relational or network resources and capabilities are evident (Gulati 2007). In this paper we develop a framework for analysing resources and capabilities in supply chains and we apply the framework for analysing the resources and capabilities of two automakers.

2. RESEARCH BACKGROUND

2.1 Definitions and Categorization of Resources and Capabilities

Researchers have defined resources in various ways. The notion that firms should be analyzed from the resource side at the firm level, not just from the product side at an industry level was introduced by Penros (1959) and expanded on by Wernerfelt (1984). Wernerfelt (1984), the first person to use the phrase "resource-based view of the firm" provided the following definition: "by a resource is meant anything which could be thought of as a strength or weakness of a given firm" (Wernerfelt 1984). According to Amit and Schoemaker (1993), a firm's resources can be defined as stocks of available factors that are owned or

controlled by the firm. Barney (2001) noted that resources are generally defined as "all assets, capabilities, organizational processes, firm attributes, information, and knowledge etc, controlled by a firm." Helfat and Peteraf (2003) defined a resource as an asset or input to production (tangible or intangible) that an organization owns, controls, or has access to on a semi-permanent basis.

There are many classifications of resources in the literature. Although scholars have tended to classify resources based on their own research interests, all of them (Barney 1991, Grant 1991, Collis and Montgomery 1995, Fahy 2002, Fahy and Smithee 1999, Hunt and Davis 2008, Miller and Shamsie 1996, Hafeez et al., 2002, Nieto and Perez 2002, Black and Boal 1994, Galbreath 2005) agreed upon two broad categories: tangible resources and intangible ones.

Grant (1991) defined capability as "the capacity for a team of resources to perform a task or activity." He also stated that organizational capability requires the expertise of various individuals to be integrated with capital equipment, technology and other resources. Nelson and Winter (1982) defined capability as "the coordination of a mix of routines, tacit knowledge and organizational memory" and they used the term *organizational routines* to refer to regular and predictable patterns of activity made up of a sequence of coordinated actions by individuals (Becker 2006). Such routines form the basis of most organizational capabilities (Grant 2005). Prahalad and Hamel (1990) distinguished between *capabilities*, which are rooted in processes and business routines, and *competencies*, which have a technology- or knowledge-based component. Amit and Schoemaker (1993) defined capabilities as a firm's capacity to deploy resources, usually in combination, using organizational processes, to bring about a desired end. According to Fahy and Smithee (1999), capability encompasses the skills of individuals or groups as well as the organizational routines and interactions through which all of a firm's resources are coordinated. Peng et al. (2008) provided a framework in which a link between resources, routines and capabilities is established. They stated that routines are what firms can do as a cluster of resources working together, and they identified two types of routines: operating routines (execution of procedures for the purpose of generating current revenue and profit) and search routines (execution of procedures that bring about desirable changes in the existing set of operating routines or that develop new ones). They have also linked operating routines to capability/competence and search routines to dynamic capabilities. Some scholars have used the terms *resources* and *capability* interchangeably.

2.2 The Role of RBV in Supply Chain Management (SCM)

According to the RBV, unique characteristics of firms lead to sustainable competitive advantage (Barney 1991; Wernerfelt 1984; Mohoney and Pandian 1992; Grant 1991; Collis and Montgomery 1995; Peteraf 1993). But all the unique characteristics do not reside within a firm's boundaries, and some resources and capabilities exist across firm boundaries (Dyer and Singh 1998; Gulati 2000, 2007; Ahuja 2000).–As Barney and Mackey (2005) noted, the continued theoretical development of the RBV requires scholars not to "simply correlate aggregate measures of resources" at the firm level but rather to move their investigations to the level of analysis "where resources reside." Thus theory and empirical attention should be aimed "at the level of the resource, not the level of the firm". The supply chain offers one such level; indeed, the role of resources at this level can be prominent (Hult et al. 2007a, b). As Table 2 shows, a number of scholars have studied supply chain management through the lens of the RBV.

There are two perspectives on SCM in the literature. The purchasing and supply perspective relates to the disparate functions of purchasing and supply management of industrial buyers, while the logistics and transportation perspective has evolved from wholesaler and retailer physical distribution and transportation functions (Tan 2001). As shown in Table 2, authors have examined supply chain competitive advantage from both perspectives.

Table 1. Some studies about SCM with emphasis on RBV

SCM literature perspective	Author	Subject of study	The role of RBV
Purchasing and supply management	Ramsay 2001	Purchasing contribution to sustainable competitive advantage	There are four condition under which purchasing functions cannot be a source of sustainable competitive advantage: functional homogeneity, perfect competitor information, perfect purchased resources mobility, universal imitation attractiveness
	Hult et al 2002	Supply chain cultural competitiveness	Supply chain cultural competitiveness as a strategic resource in SCM
	Wu et al., 2006	Supply chain capabilities and firm performance	IT alignment and IT advancement as a strategic resource that impact on four dimensions of supply chain capabilities: Information exchange, coordination, activity integration and SC responsiveness
	Hult et al., 2006	Knowledge as a strategic resource in supply chains	Effective fit between the eight knowledge elements and a particular strategy type is valuable, rare and inimitable as a strategic resource
	Hult et al., 2003	Organizational learning as a strategic resource in supply management	Organizational learning has passed on the criteria for strategic resource in RBV
	Lavie 2006	The competitive advantage of interconnected firms that	Relational view and social network theory complement the RBV to explain how interconnected firms combine network resources and internal resource endowment to achieve

		supply chains are one type of them	competitive advantage
	Duschek 2004	Inter-firm resources and sustainable competitive advantage	Relational view as an amalgam of RBV and TCE. SCs as a kind of interconnected firms
	Miles and Snow 2007	Applying different organizational theories to SCM	By incorporating the ideas and expertise of their supply chain partners, lead firms can direct the network towards innovation as well as cost reduction.
	Ketchen and Hult 2007a	The best value supply chains	RBV assumes that unique resources exist at the supply chain level and that supply chains can be inimitable weapons
	Ketchen and Guinipero 2003	Intersection between strategic management and supply chain management	Which practices in supply chain management can be valuable, rare, inimitable and non-substitutable?
	Hult et al., 2007a	Leadership, buying center and supply chain performance	Well-operating buying center with appropriate leadership can be a strategic resource.
	Hult et al., 2007b	Strategic supply chain management	A supply chain's unique confluence of a culture of competitiveness and knowledge development seems to establish a sustainable competitive advantage
	Rungtusanathan et al., 2003	Supply chain linkages and operational performance	Supply chain upstream and downstream linkages can be strategic resources if they pass VRINN criteria
	Cousins and Menguc 2006	Inter-firm socialization and integration in supply chain and its impact on supplier communication and operational performance	Supply chain socialization as a strategic resource that is valuable, rare, inimitable and non-substitutable and also intangible
	Hunt and Davis 2008	How purchasing and supply chain management can create competitive advantage	Based on resource advantage theory as a branch of RBV, explaining four conditions whereby purchasing and SCM can create competitive advantage
	Holldorson et al. 2007	Contemporary theories of SCM	From RBV supply chain management have seen as coordination relational assets
Physical distribution and transportation	Olavarrieta and Ellinger, 1997	Role of logistics function in creating and sustaining competitive advantage	Construction of a generalizable typology of logistics-related resources using three categories: input factors, assets and capability

2.3 Analysing Strategic Resources and Capabilities

According to the RBV, to develop their strategy, firms must identify, develop, protect, deploy and leverage strategic resources and capabilities. Some authors have developed frameworks to help achieve the various stages (Grant, 2005).

Vourinen et al. (2006) studied network resources and proposed a framework for assessing them in four steps: evaluation of the value of the resources of single companies, awareness of others' resources, applicability of the resources, and allocation and development of the resources. Bowman and Ambrosini (2007) attempted to identify valuable resources – ones that permit premium pricing or enable costs to be lowered relative to competitors. They also noted that valuable resources can generate three types of competitive advantage: a cost advantage, a price premium advantage, and a volume-based advantage. Marino (1996) provided a two-phase method for analyzing strategic resources. Phase one is associated with identifying core capabilities and consists of several steps: prepare current product/market profile, identify sources of competitive advantage and disadvantage in the principal product/market segments, determine organizational capabilities and competencies, sort out the core competencies and capabilities, and synthesize and reach consensus on core capabilities. Phase two is related to developing and leveraging core capabilities and also includes several steps: assess future conditions in existing markets served, identify emerging markets related to our skills, and formulate development plans.

Grant (2005) outlined three steps for resource and capability analysis: identify the key resources and capabilities (explore the links between resources and capabilities), appraise resources and capabilities (strategic importance, relative strengths), and develop strategy implications (in relation to strength, in relation to weakness). Clulow et al. (2007) and Fahy and Smithee (1999) addressed the strategic role of management in identifying, developing, deploying and protecting key resources. Some studies have been conducted to identify strategic resources within firms (e.g. Mills et al. 2003; Bowman and Ambrosini 2007; Marino 1996; De Olivira Wilk and Fensterseifer 2003; Hall 1993; Carmelli 2004; Hafeez et al. 2002). In this research we deal with the first step, which is the identification of strategic resources and capabilities. But our level of analysis is both intra-organizational and inter-organizational, what we call the supply chain level of analysis.

3. DEVELOPMENT OF FRAMEWORK

In this research we have adopted the resource-conduct-performance paradigm rather than the structure-conduct-performance (Porter 1985). We have assumed that a supply chain's resources and capabilities direct the way the supply chain is conducted and lead to the performance of the supply chain. Therefore, we have developed a theoretical framework for explaining supply chain strategy, as shown in Figure 1.

The relational view (RV) adds a new dimension to the definition of a firm's strategy since a firm's competitiveness increasingly depends on the networks in which it operates. There are three types of inter-organizational capabilities (Rodriguez Diaz and Espino Rudriguez 2008): (1) relational capability (Lorenzoni and Liparini 1999) focuses on the focal firm's ability to select suitable partners; (2) combinative capability (Dyer and Singh 1998) refers to the resources that companies can combine to achieve a competitive advantage; and (3) absorptive capacity (Cohen and Levithal 1990) enables companies to improve their competitive position by acquiring knowledge from external relationships with other companies.

As it has already been said, according to many scholars, a firm's resources and capabilities do not exist only within the firm's boundaries; strategic resources and capabilities are found across firm boundaries as well. Gulati et al. (2000) noted that a firm's membership in a network equips it with some key network resources. They also emphasized that the network's structure, membership and quality of ties are network resources and capabilities. Moreover, Gulati (2007) classified network resources in two categories: structural resources and relational resources. Relational resources are defined as the quality of the ties of the focal firm with its immediate partners. Dyer and Singh (1998) examined the factors which increased the ties between an OEM and its partners. They identified four sources of sustainable competitive advantage in inter-organizational partnerships: (1) relation-specific investment, (2) knowledge sharing routines, (3) complementary capabilities, and (4) effective governance mechanisms. Thus supply chain resources and capabilities can be classified in two categories: internal resources and capabilities (based on RBV) and relational ones (based on RV). We propose a framework for identifying and analysing supply chain resources and capabilities, shown in Figure 2.

Lavie (2006) argued that in inter-organizational alliances the focal firm has two categories of resources: shared and non-shared resources. The shared resources represent the resources that the focal firm – with the aim of exploiting the relational benefits – has shared with its partners to create synergies with the partners' resources, leading to relational competitive advantage. The focal firm has another category of resources within its own boundaries that are not shared with its partners, and the firm's use of those resources is an attempt to create Recardian rents and the sustainable competitive advantage described in the RBV.

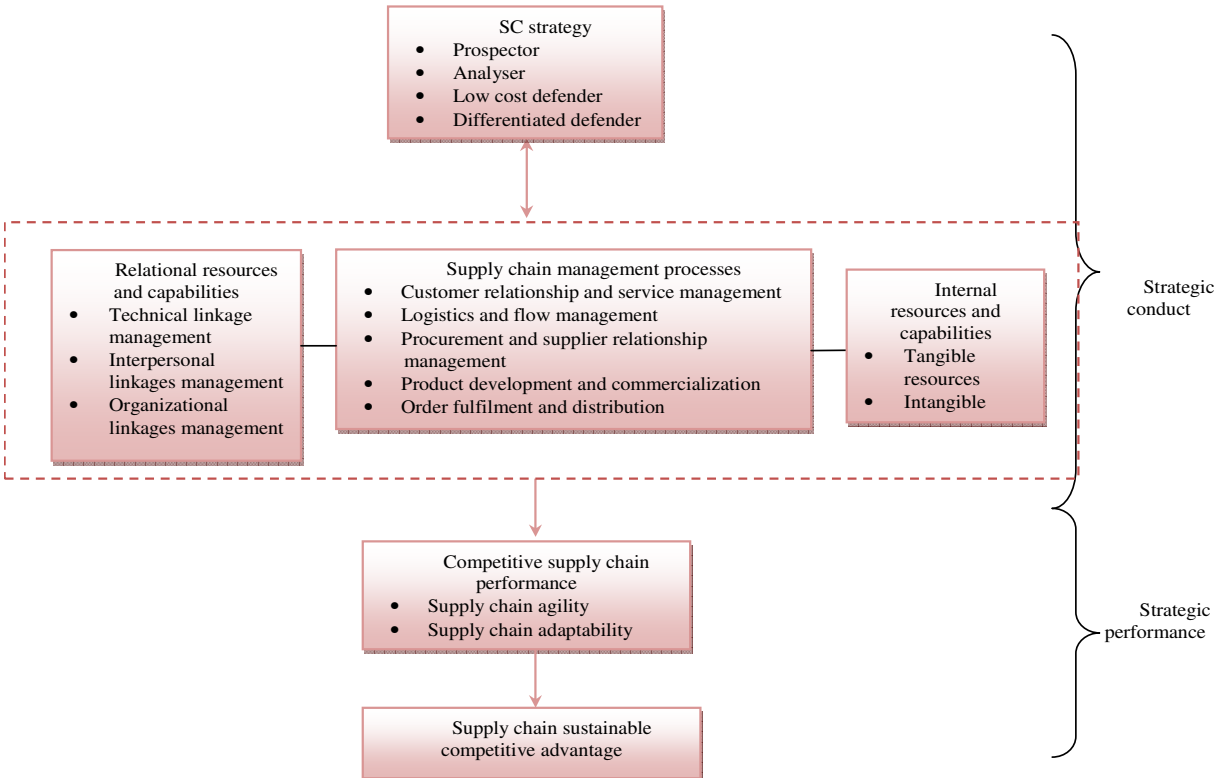

Figure 1. A model to explain a supply chain's strategic conduct and performance (Abadi, 2009)

Furthermore, Gulati (1998, 1999, 2007) divided the network resources of the focal firm into structural and relational resources. Structural resources represent the resources that belong to the focal firm due to its membership in a specific network, and within such a network it relates to many partners. Relational resources refer to the quality of the tie between the focal firm and its immediate partners. Das and Teng (2000) investigated how firms can achieve sustainable

competitive advantage in alliances based on the RBV. They argued that in order to enhance the possibility of alliance formation, firms must be equipped with non-transferable, inimitable and non-substitutable resources inside the firm and also aligned with their partners in terms of their resources.

A supply chain is made up of several alliances between the focal firm and its strategic suppliers (Lorange 2002; Gulati and Singh 1998, Gulati et al. 2005; Gulati and Kletter 2005; Das and Teng 2000; Cousins et al. 2006). The focal firm or OEM has the responsibility of guiding and directing the whole chain. There is a model of competition whereby the supply chain is guided by the focal firm/OEM and competes with other chains (Christopher 1998; Christopher and Jüttner 2000; Rice and Hoppe 2001; Hult and Ketcken 2007; Harland et al. 1999; Hult et al. 2007a,b; Ketchen and Hult 2007a,b; Sahay et al. 2006; Ireland et al. 2002; Ireland and Webb 2007; Kotzab et al. 2005; Rese 2006). In such cases the supply chain must be equipped with the two types of resources and capabilities that we referred to as internal and relational resources (see Figure 1).

Our meaning of the internal resources and capabilities of the supply chain is the resources and capabilities that reside within the focal firm's boundaries. According to Nelson and Winter (1982), the main constituent element of firms and organization are "routines" and they are the most important element of capabilities (Grant 2005). Moreover, capabilities are found in business processes of firms so it can be concluded that routines in evolutionary economics could be the firm's business processes (Peng et al. 2008). As noted by Ray et al. (2004) the effectiveness of business processes could be a good dependent variable in resource-based empirical studies. Some scholars (Lambert et al. 2005; Lambert 2006; Stock and Lambert 2001) tried to provide a clear classification and definition of supply chain management processes. They argued that their proposed classification has more strategic orientation compared with other classifications (like SCOR classification of supply

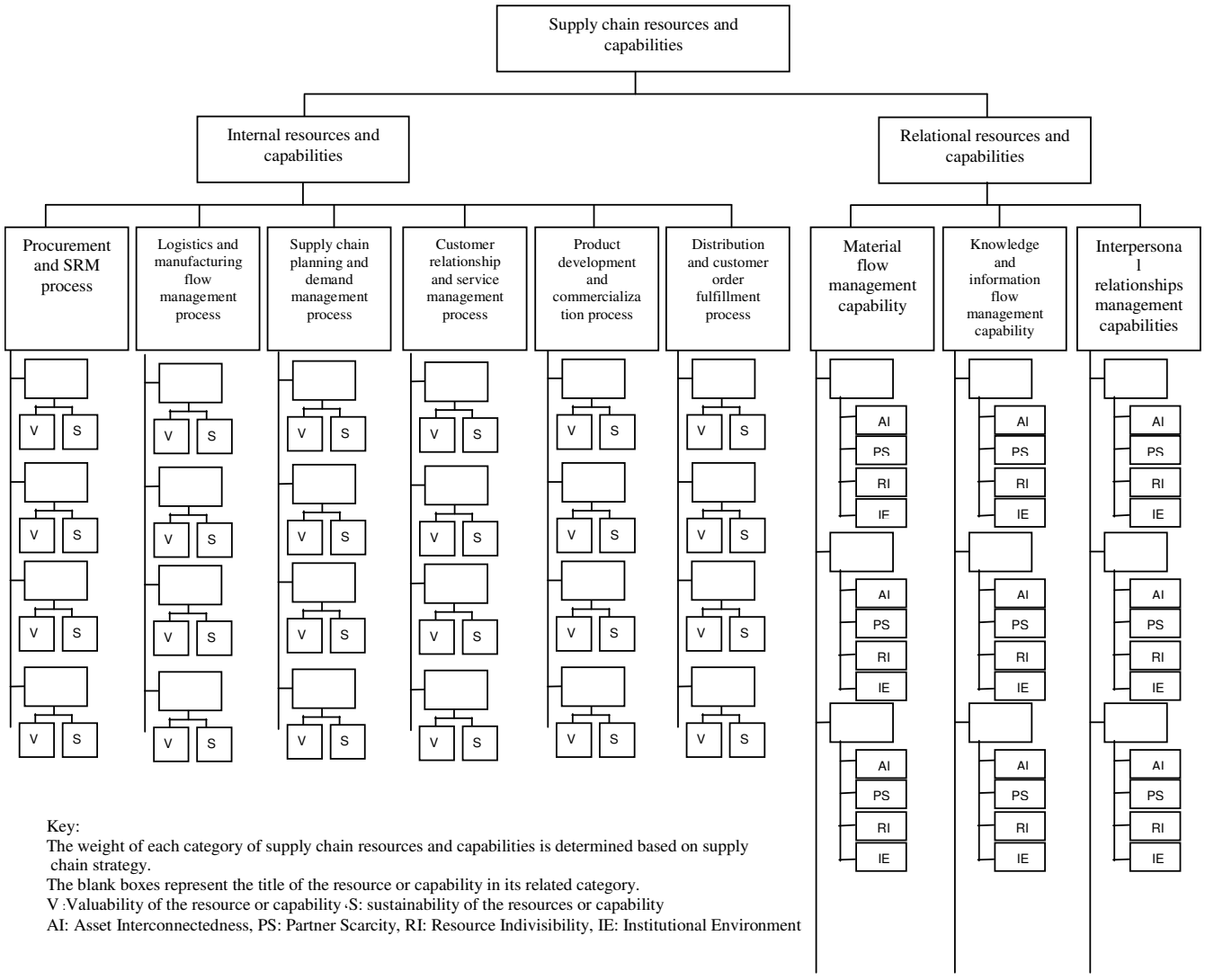

Figure 2. Framework for identifying and analysing supply chain resources and capabilities

chain processes). In this research, we modified the classification and decreased the number of processes from eight to six (based on similarities among processes). The six SCM processes could be considered a subsection of the internal resources and capabilities of supply chains.

Another segment of supply chain resources and capabilities is relational resources and capabilities. It is not

possible for an OEM to establish a powerful relationship with many suppliers, so it usually selects a few strategic suppliers and tries to develop strong ties with them. Cordon and Vollman (2008) argued that typically ten suppliers are appropriate for establishing relational capabilities. Seuring et al. (2003) classified supply chain relational resources and capabilities in three categories:

1. Material flow management capabilities
2. Knowledge and information flow capabilities
3. Interpersonal linkages management capabilities

Material flow management capabilities develop between supply chain partners to facilitate the smooth flow of material among them. Knowledge and information flow management capabilities are shared between supply chain partners in order to facilitate effective sharing of knowledge and information. Croom and Betchlor (1997) and Hult et al. (2004) studied inter-organizational learning as part of knowledge and information flow management capabilities. Interpersonal linkages management capabilities refer to the ability and desire of two partners' staff to cooperate and establish an effective inter-personal relationship. Some scholars (e.g. Hult et al. 2002b; Hult et al. 2007a) called it "supply chain cultural competitiveness." Cousins and Menguc (2006) examined inter-firm socialization as another aspect of interpersonal linkages management capabilities.

Several authors (Barney 1991; Grant 1991; Peteraf 1993; Lippman and Rumelt 1982; Collis and Montgomery 1995; Amit and Schoemaker 1993; Dierichx and Cool 1989; Black and Boal 1994) have studied the characteristics of the resources and capabilities for creating and sustaining competitive advantage. Those characteristics can be categorized in two classes: they must be sustainable and valuable (Foss and Knudsen 2003; Fahey and Smithee 1999; Bowman and Ambrosini 2007; Hoopes et al. 2003; Cluloo et al. 2007; Stravistava et al. 2001; Mills et al. 2003). Wade and Hulland (2004) argued that there are two phases in RBV: phase one is related to the scarcity of resources and capabilities, which makes them valuable (i.e. value); phase two is associated with the non-transferability, inimitability and non-substitutability of the resources and capabilities (i.e. sustainability). Therefore, we used two characteristics (i.e. sustainability and value) to assess the internal resources and capabilities of supply chains. Then, we developed a procedure for identifying the strategic resources and capabilities in a supply chain, shown in Table 3.

Table 2. Procedure for assessing a supply chain's internal resources

Assessment of internal supply chain resources and capabilities							
Valuable?							
	High positive impact	Positive impact	Nil impact	Negative impact	High negative impact	Unknown	na
What is its impact on product manufacturing cost?							
What is its impact on customer desire to pay more than product price?							
What is its impact on firm abilities to seize opportunities and defuse threats?							
How many competitors have already achieved that?	None	Some of them	Half of them	Most of them	All		
What level of performance does it offer compared to competitors?	Indisputable leadership	Level with the best	Average for industry	Below industry average	Well below industry average		

Sustainable?							
How easily can competitors recognize it?	Very invisible	Rather invisible	Only if they are looking for it	Rather easily	Very easily	Unknown	
How long would it take for a competitor to imitate?	More than five years	2 to 5 years	6 to 24 months	1 to 6 months	Less than one month		
What proportion of sales revenue would it cost for them to imitate?	More than 10%	5-10%	1-5%	0.5-1%	Less than 0.5%		
Could another resource substitute for it and diminish its advantage?	Very low	Low	Average	Much	Very much		
To what extent is the linkage between resource and capability and performance identifiable for competitors?	Very low	Low	Average	Much	Very much		
To what extent is the resource and capability tradable in the factor market?	Very low	Low	Average	Much	Very much		

The procedure for assessing the internal resources and capabilities of a supply chain is based on strategic characteristics of the resources in the RBV. We reinforced some aspects of the procedure proposed in Mills et al. (2003), and we added a question to assess the value of a resource based on the value price cost (VPC) framework (Hoopes et al. 2004; Bowman and Ambrosini 2007). In the VPC framework, a resource or capability is valuable only when it increases the difference between a firm's value and cost (V-C) compared to its rivals. We also added some questions in the sustainability section of the assessment procedure based on causal ambiguity (Lipman and Rumelt

1982) and the non-tradability of the resource or capability (Grant 2005; Amit and Schoemaker 1993; Dierichx and Cool 1989; Black and Boal 1994).

In order to assess the relational resources and capabilities in a supply chain, we provided a procedure based on relational views (Dyer and Singh 1998), shown in Table 4. In this procedure, we assumed that relation-specific resources and capabilities are valuable, and we assessed the sustainability of the resources and capabilities only. This procedure was developed based on the works of a number of researchers (Dyer and Singh 1998; Duscheck 2004; Mesquita et al. 2008; Dyer and Hatch 2006; Dyer et al. 2008). Dyer and Singh (1998) and Duscheck (2004) suggested that to assess the potential of relational resources and capabilities to create and sustain competitive advantage, the relation-specific resources and capabilities must meet four conditions:

1. Inter-organizational asset interdependence: inter-organizational asset interdependence is based on the accumulation of inter-organizational resource stocks. In the course of cooperative inter-firm relations, increasing co-specialization of network resources often takes place. As supernormal returns could not be achieved without cooperative relations, an important strategic implication of this imitation barrier can be identified according to which networking firms should specifically try to establish bundles of relation-specific resources in order to specifically appropriate the general potential of inter-firm relations.
2. Partner scarcity: Relational rents or cooperative core competencies are often not easy to imitate due to partner scarcity, i.e. partners with complementary resources and relational capacities. A key implication for this limitation barrier is that there is first mover advantage for finding complementary network partners.
3. Resource indivisibility: this imitation barrier means that in networks, the combination and/or the mutual creation of resources can be carried out to such an extent that it becomes impossible to separate relation-specific resources without destroying the resource advantage.
4. Institutional environment: country-specific institutions are typical examples, for instance the Japanese behavioral regulation of cooperative arrangements is based substantially on trust. Such country- or region-specific formal and informal behavioral norms are difficult to imitate, since they require global institutional modification.

4. RESEARCH METHOD

Gibbert (2006) examined the paradox of uniqueness and generalizability in RBV research. From a methodological point of view, the external validity of research findings is an important criterion for evaluating the research quality. Yet, according to the RBV, firms should attempt to find unique internal specifications. In order to get around this seeming paradox, Gibbert (2006) proposed a framework for selecting the best research method based on the goals of the research in the RBV (see Figure 2).

He also suggested research methodologies for each category of resources:

- For cross-industry resources: multiple case studies, survey.
- For industry-idiosyncratic resources: cross-case analysis on the firm level, single cases on the industry level.
- For firm-idiosyncratic resources: single case study, ethnographic methods, participants and/or direct observational research approach on the firm level.
- For rules for riches: the sequence of research methods suggested in Figure 3.

Table 3. Procedure for assessing a supply chain's relational resources

Assessment of relational resources						
Inter-organizational asset interdependence						
How long have you had a close relationship with your partner in regard to this resource and capability?	More than 4 year	3 – 4 year	2 - 3 year	1 – 2 year	Less than one year	Unrelated
Partner scarcity						
To what extent are partners with relational capacities and complementary resources for this resource and capability rare?	Very much	Much	Average	Low	Very low	Un.
Indivisibility of resource and capability						
To what extent does separation of this relation-specific resource and capability from the partner destroy the resource and capability advantage? (Is the capability overall destroyed if the firm does not cooperate with this partner?)	Very much	Much	Average	Low	Very low	Un.
Institutional environment						
To what extent is the resource and capability embedded in the country or region's formal and informal behavioral norms?	Very much	Much	Average	Low	Very low	Un.

In this research, we selected two automakers in the Iranian automotive industry in order to identify and analyze the strategic resources in two supply chains and find the unique characteristics of supply chains in this industry. The two companies, Iran Khodro Company and Saipa, were chosen because they procure most of their car parts domestically, unlike other automakers in Iran, which are supplied through Japanese or European manufacturers in terms of CKD (complete knock-down) such as Mazda, Peugeot-Citroën and Renault-Nissan. The most relevant function in the two companies is the procurement and purchasing function. Both companies established a separate firm specifically to supply auto parts and some engineering works. Since the subject of our study means that we fall in the industry-idiosyncratic resources category, we have

adopted cross-case analysis as our main research method (Yin 1994; Gilbert, 2006; Miles and Huberman 1994).

4.1 Data Gathering

To gather the data, we used semi-structured interviews for both internal resources and relational resources. In order to select the right people to interview, first we contacted people in the supply chain function in both automakers and then asked him/her to introduce us to the relevant people. We needed to interview people who had an overview of the industry as well as supply chain knowledge. Table 4 summarizes the characteristics of our semi-structured interview respondents.

In addition, we interviewed seven academic experts in SCM and the automotive industry to assess the weights of each supply chain strategy. Data gathering was carried out in the first half of 2009. In sum, we conducted 24 semi-structured interviews. The interview team consisted of one person (the author) and the interview process was based on a predetermined interview protocol (which was discussed with some practitioners and academics beforehand and modified accordingly).

Our interview protocol included three sections related to: 1) the interviewee's personal information; 2) identifying and analyzing the internal resources and capabilities of the supply chain; and 3) identifying and analyzing the relational resources and capabilities of the supply chain. In the relational section, the key suppliers upstream in the supply chain had to be identified. So first we asked interviewees to rate the strategic suppliers in terms of three criteria (Svensson 2004; Dyer et al. 1998; Bensaou 1999; Olsen and Ellram 1997; Rese 2006, Kaufman et al. 2000):

- High impact of supplier's parts on enhancing auto technology
- High impact of supplier's parts on auto manufacturing cost
- High impact of supplier's parts on automaker's brand.

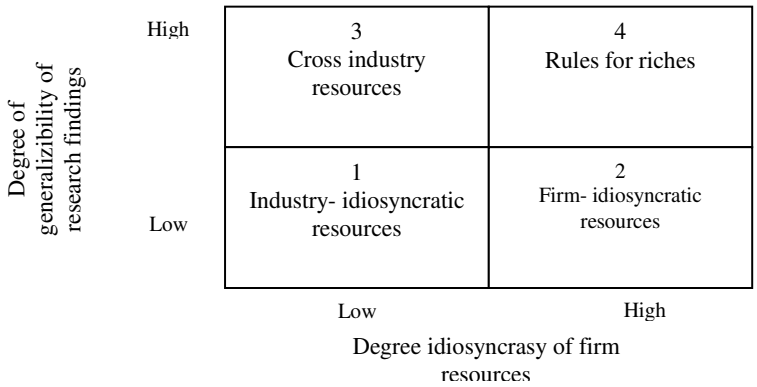

Figure 3. A typology of resources based on the uniqueness of a firm's resources and generalizability of research findings (Gibbert 2006)

Table 4. Characteristics of informants

Case	SCM processes	Position	Experience
Irankhodro	Procurement and SRM, Logistics and manufacturing flow management, supply chain planning and demand management	Warehouses and line feeding manager	13
		Supplier logistics affairs director	9
		Supply strategy director	7
		Purchasing director	8
		Research and development deputy	13
		Inside and abroad sites logistics manager	11
		Supplier's affair director	9
		Manufacturing strategy manager	5
Saipa	Procurement and SRM, Logistics and manufacturing flow management, supply chain planning and demand management	CEO's consultant	12
		Organizational excellence manager	9
		Orders planning and control manager	11
		Supply strategy manage	6
		Strategic planning manager	6
		Suppliers systems and IT management manager	7
		Supplier planning and logistics deputy	13
		Business development deputy	10

To familiarize interviewees with the concepts of RBV, we sent a brief explanatory document to them before the interview and asked them to read it. In order to specify the supply chain strategy we used the self-typing paragraph method (James and Hatten, 1995). Generally, the interview process consisted of two phases: first identifying the resources and capabilities, and then assessing and analyzing. Each interview took 4 hours on average. To capture the interview content if the interviewee did not allow it to be recorded, the interviewer noted the key points as far as possible. All of the interviews were conducted face-to-face in the interviewee's location.

4.2 Data Analysis

Yin (1994) noted that there are two approaches to qualitative data analysis: theory-based and case description.

The first approach uses existing theories to create an initial proposition that guides the design and analysis of the study. The second approach relies on a rich description of the case, which serves as a mechanism for organizing and framing the study. In this research the theory-based approach was used due to the great amount of qualitative information. However, as researchers we attempted to be open-mind during the interview and to welcome new ideas and opinions from the interviewees.

According to Miles and Hubeman (1994), data analysis includes three distinct steps: data reduction, data display, and approving and concluding. Data reduction refers to the selection, concentration, simplification and summarization process and the transfer of data from written notes and recorded disks. In the data reduction phase we used a content analysis technique, which includes three stages, to select and summarize the data (Creswel, 2003) Content:

1. Preparing information: the important aspects of study from the interviews, such as history, development trends in the supply chain and auto industry infrastructure, are highlighted and selected.
2. Converting overall content to concepts: this stage was accomplished in two steps: first the text was divided into several paragraphs and then the paragraphs were arranged in terms of theme relevance in order to identify the main ideas and concepts.
3. Classifying identified concepts into categories: after removing repetitive concepts, the concepts were classified into supply chain resources and capabilities categories according to the framework shown in Figure 2.

We had prepared a temporary summary of the case study, representing a mix of what the researcher knows about the case study and what he/she obtains from the case study (Miles and Huberman 1994). In this research the short summary of the case study is applied as a mechanism to summarize the case study related data in a document and acquire a general understanding of various aspects of the case study. It also contains background information on the automaker's supply chain; brief details of the network of supply chain actors including the procurement organizations and first tier suppliers; and a description of the role of the procurement organization and its relationship with the automaker. The possible challenges facing the automaker's supply chain and success factors were also noted. Once the results of the interviews were classified and summarized into two categories of supply chain resources and capabilities – internal and relational –the score of the resources' value and sustainability were calculated.

Data display, the second step in data analysis, represents the organized assembly of information, which increases the conclusion of the data (Miles and Huberman 1994). In this research, a theoretical framework and well-defined concepts are used to display data within and across cases.

Approving and concluding, the final step in qualitative data analysis, gives meaning to the results takes place by considering disciplines and arrangement, explanations, possible configurations and causal flows (Miles and Huberman, 1994). In this research, the main mechanism for approving and concluding the result relies on cross-case comparisons. The purpose of cross-case comparisons is not to be influenced by single case results (Meyer 2001).

To calculate the supply chain sustainable competitive advantage scores, we asked academic experts to judge the relative importance with regard to supply chain strategies of each SCM process in categories for internal and relational resources. We used the weighting method (Mehrgan 2004) to specify the relative importance of each category of internal and relational resources. The formula is as follows:

$$R_p = \sum_{j=1}^{k} (R_{pj})$$

Where:

R_p : sum of judgment converted ranks for P objective

R_{pj} : converted rank assigned to P objective by J decision maker

K : number of decision makers

W_p : the weight of P objective

Therefore:

$$W_p = \frac{R_p}{\sum_{j=1}^{k} (R_{pj})}$$

Because this research focuses on the upstream supply chain, only the SCM processes related to this part of the supply chain are included here (i.e. procurement and SRM process, logistics and manufacturing flow management process, and supply chain planning and demand management process). We quantified the responses received to the assessment procedure shown in Table 3 and 4 using a five-item Likert scale (Milles et al. 2003). The relative score of each resource and capability was calculated in terms of total existing scores. Hence, the maximum existing score in the value section is 25, and by dividing the obtained score of the resource and capability by the maximum existing score, we calculated the relative score of each resource and capability (i.e., x/25). We repeated the process for relational resources. In the case of resource and capability iteration, the average score of resource and capability was calculated. Therefore, for each SCM process, the relative score of any resource and capability was calculated and then multiplied in relative importance of each process in related supply chain strategy, and thus a relative score for the value and sustainability of each resource and capability was determined. In brief, the qualitative data analysis methods are exhibited in Figure 4.

5. RESULTS

The results of each case study were organized and then compared with each other using cross-case comparisons.

5.1 Iran Khodro's Supply Chain Case

Iran Khodro Company (IKCO) produced almost 553,000 vehicles in 2007 and had almost 46 percent share of Iran's passenger car market (Iran Mine and Industry Ministry report, 2007). The company established a separate firm (called SAPCO) in 1991, especially to source parts for automakers. SAPCO undertakes all activities related to the

procurement function for IKCO; it has a supplier base of 450 suppliers and 1,371 personnel. The scores for internal and relational resources and capabilities for Iran Khodro's supply chain are shown in Table 6 and 7.

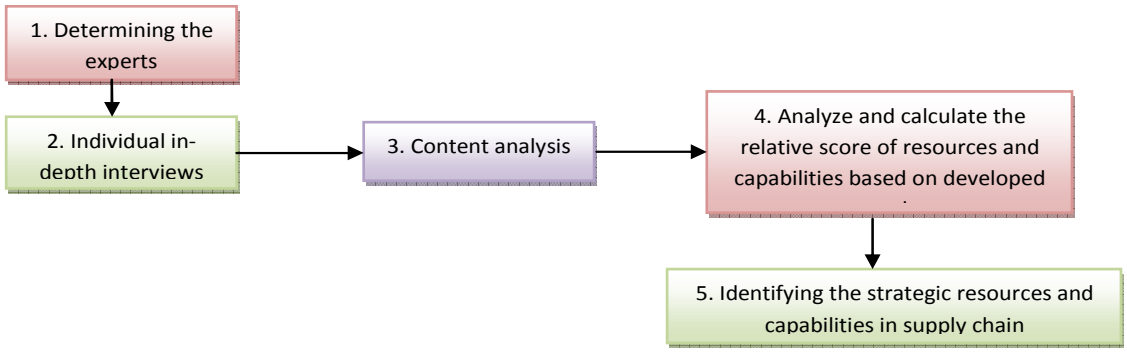

Figure 4. Qualitative Data Analysis Steps

Table 5. Value and sustainability scores for IKCO's internal and relational SC resources

Internal resource and capability	Fr. of resource capability iteration	Av. sustainability score	Av. value score	Relational resources	Fr. of resource capability iteration	Score
Supplier evaluation and development procedure	6	0.58	0.87	Abilities for Kanban and Synchronized production control with key suppliers	7	0.71
Level of machinery automation	1	0.5	0.88	Group working culture with suppliers	1	0.55
Kanban and Synchronize production control procedure	3	0.67	0.9	Clarity and benevolence culture among supply network	1	0.61
Labor knowledge about internal logistics	1	0.67	0.88	Common educating facilities with suppliers	1	0.45
Total production system	3	0.64	0.81	Excellence council with suppliers	1	0.6
Auto parts tracking system	2	0.51	0.82	Common packaging engineering abilities	1	0.46
Planning and demand management procedure in whole chain upstream	1	0.6	0.92	Common problem solving abilities	2	0.87
Negotiation's skills with suppliers	2	0.7	0.78	Collaborative planning, forecasting and replenishment	2	0.6
Flexible production abilities	2	0.73	0.82	Common product development and improvement team	1	0.85
Experienced and knowledgeable labor in manufacturing	2	0.69	0.92	Trust between IKCO and abroad suppliers	1	0.77
Knowledge and experience in auto cost analysis	3	0.38	0.83	IKCO's experienced manager as main decision makers in suppliers	1	0.78
Technical knowledge about material science	2	0.49	0.8	GPRS	1	0.66
Target costing	1	0.36	0.88	Common improvement teams between IKCO and its suppliers	1	0.9
Safety parts requirements	1	0.45	0.92			
Suggestion system	1	0.46	0.76			
Mutual trust and support culture among purchasing staff and team work	2	0.91	0.9			
Assembly line sequencing abilities	1	0.73	0.88			
Procedure for production process's qualification evaluation	1	0.4	0.84			
In process quality management abilities	1	0.53	0.84			
Production process engineering abilities	1	0.7	0.84			

Table 5 shows the scores of internal and relational resources and capabilities for IKCO's supply chain. Given that we interviewed with more than one person in each case study, in the table a column shows the frequency of interviews and also we should calculate the average score for each resource and capability.

5.2 SAIPA's Supply Chain Case

SAIPA Company produced almost 551,000 vehicles in 2007 and had almost 52 percent share of Iran's passenger car market (Iran Mine and Industry Ministry report, 2007). The company established another firm (called Saze Gostar) especially to source parts for automakers. Saze Gostar is involved in all activities related to the procurement function for SAIPA; it has a supplier base of 500 suppliers and 557 personnel. The scores for internal and relational resources and capabilities for SAIPA's supply chain are shown in Tables 8 and 9.

Table 6 shows the scores of internal and relational resources and capabilities for SAIPA's supply chain. Given that we interviewed with more than one person in each case study, in the table a column shows the frequency of interviews and also we should calculate the average score for each resource and capability.

Table 6. Value and sustainability scores for SAIPA's internal and relational SC resources

Internal resource and capability	Fre. of resource capability iteration	Ave. sustainability score	Ave. value score	Relational resources	Fre. of resource capability iteration	Score
Ability for repackaging parts for conformance with product variety	2	0.74	0.54	VMI	4	0.6
High organizational commitment of production' line staff	2	0.92	0.9	Regular supplier site visits	2	0.5
Abroad of country regional purchasing offices	1	0.8	0.53	Pallet management system	1	0.35
Experienced labor in purchasing	2	0.88	0.73	Parts batch shipment system	1	0.35
Negotiation skills with suppliers	3	0.88	0.73	Value engineering teams	2	0.75
Abilities for inbound logistics planning	3	0.76	0.5	Supplier suggestion system	2	0.5
Working culture for preventing of production line stop due to stock out	1	0.8	0.89	Common 6 sigma teams with suppliers	2	0.76
Supplier evaluation and development procedure	4	0.96	0.55	EDI with suppliers	1	0.25
Manufacturing engineering abilities	2	0.76	0.46	Common planning committee	1	0.7
One time every 4 days inventory replenishment rate	3	0.95	0.91	Common problem solving teams	2	0.75
Good and visible working culture between SAIPA and Saze Gostar	3	0.92	0.96	Trust between SAIPA and its suppliers	3	0.85
Target costing	4	0.92	0.45	Common training workshops with suppliers	2	0.45
				Consistence IS between SAIPA and its suppliers	1	0.71
				Logistics experience sharing committee with suppliers	1	0.78
				Guest engineers for sharing knowledge	1	0.83

5.3 Comparing supply chain strategic resources and capabilities across cases

Given that supply chain strategy may be different among various firms and also within each supply chain, some elements of supply chain management are more important than others (Hult et al. 2006), and thus strategic resources and capabilities may vary. In our research, with regard to the relative weight, or importance, of SCM processes in a supply chain's internal resources, as well as the weight of dimensions of relational resources, we calculated the final score of the two supply chains' resources and capabilities.

It was found that IKCO has a low cost defender supply chain strategy, so we put the right weight on the SCM processes and elements of relational resources, as shown in Table 7 and 8, which reflect the final score of IKCO's supply chain resources and capabilities.

Table 7. Final score of IKCO's internal supply chain resources and capabilities

Weighted score of process sustainability	Weighted score of process value	Process weight low cost defender SC strategy	Ave. score of sustainability	Ave. score of value	Sustainability score	Value score	Resource and Capability	Process
0.17	0.27	0.32	0.54	0.84	0.58	0.87	Supplier evaluation and development procedure	Procurement and SRM
					0.7	0.78	Negotiation skills with suppliers	
					0.38	0.83	Knowledge and experience in auto cost analysis	
					0.49	0.8	Technical knowledge about material science	
					0.36	0.88	Target costing	
					0.45	0.92	Safety parts requirements	
					0.46	0.76	Suggestion system	
					0.91	0.9	Mutual trust and support culture among purchasing staff and team work	
0.18	0.25	0.29	0.62	0.86	0.5	0.88	Level of machinery automation	Logistics and manufacturing flow management
					0.67	0.9	Kanban and synchronized production control procedure	
					0.67	0.88	Labor knowledge about internal logistics	
					0.64	0.81	Total production system	
					0.73	0.82	Flexible manufacturing ability	
					0.69	0.92	Experienced and knowledgeable labor in manufacturing	
					0.73	0.88	Assembly line sequencing ability	
					0.4	0.84	Procedure for production process's qualification evaluation	
					0.53	0.84	In-process quality management system	
					0.7	0.84	Production process engineering abilities	
0.14	0.22	0.25	0.55	0.87	0.51	0.82	Auto parts tracking system	Supply chain planning and demand management
					0.6	0.92	Planning and demand management procedure in whole chain upstream	
0.16	0.25	Average final score of internal resources and capabilities						

It was specified that SAIPA has a low cost defender supply chain strategy also, so we put the right weight on the SCM processes and elements of relational resources, as shown in Table 9 and 10, which the final score of SAIPA's supply chain resources and capabilities.

Now we can compare the SC strategic resources and capabilities of the two cases. However, it should be noted that this comparison is only possible because of the two automakers have the same supply chain strategy (i.e. low cost defender). Table 11 shows the scores of both for SC internal resources and capabilities.

Although the comparison between the two supply chains indicates that the value of their internal resources and capabilities is the same, SAIPA has better sustainability than IKCO in this regard. In terms of the SC relational resources, IKCO seems better than SAIPA. Compared to SAIPA, IKCO has a longer history of cooperation with suppliers (this result is explained by path dependency criteria in RBV and inter-organizational asset interdependence in the relational view). This result is consistent with the fact that IKCO dedicates many more resources to managing the relations with suppliers. IKCO has 1.371 people to manage relations with 450 suppliers while SAIPA has 557 people for 500 suppliers.

Table 8. Final score of IKCO's relational supply chain resources and capabilities

Weighted score	Weight in SC strategy	Ave. sustainability score	Sustainability score	Title	Relational resources and capability dimension
0.01816397	0.029777	0.61	0.71	Abilities for Kanban and synchronized production control with key suppliers	Material flow management
			0.46	Common packaging engineering abilities	
			0.66	GPRS in transportation system	
0.00918118	0.012407	0.74	0.6	Excellence council with key suppliers	Knowledge and information flow management
			0.6	CPFR	
			0.85	Common product development and improvement team	
			0.9	Common improvement teams between IKCO and its suppliers	
0.00166227	0.002481	0.67	0.55	Group working culture with suppliers	Interpersonal linkages management
			0.61	Clarity and benevolence culture among supply network	
			0.45	Common educating facilities with suppliers	
			0.87	Common problem solving abilities	
			0.77	Trust between IKCO and suppliers abroad	
			0.78	IKCO's experienced managers as main decision makers in suppliers	
0.00966914	Average score of supply chain relational resources				

Table 9. Final score of SAIPA's internal supply chain resources and capabilities

Weighted score of process sustainability	Weighted score of process value	Process weight low cost defender SC strategy	Ave. score of sustainability	Ave. score of value	Sustainability score	Value score	Resource and Capability	Process
0.22	0.28	0.32	0.69	0.88	0.55	0.96	Supplier evaluation and development procedure	Procurement and SRM
					0.73	0.88	Negotiation skills with suppliers	
					0.53	0.8	Foreign regional purchasing offices	
					0.73	0.88	Experienced labor in purchasing	
					0.45	0.92	Target costing	
					0.96	0.92	Good and visible working culture between SAIPA and Saze Gostar	
					0.89	0.8	Working culture for the prevention of production line stops due to stockouts	
0.14	0.23	0.29	0.6	0.79	0.54	0.74	Ability to repackage parts for conformance with product variety	Logistics and manufacturing flow management
					0.9	0.92	High organizational commitment of production line staff	
					0.5	0.76	Abilities for inbound logistics planning	
					0.46	0.76	Manufacturing engineering abilities	
0.24	0.24	0.25	0.91	0.95	0.91	0.95	Once in every 4 days inventory replenishment rate	Supply chain planning and demand management
0.2	**0.25**	Average final score of internal resources and capabilities						

Table 10. Final score of SAIPA's relational supply chain resources and capabilities

Weighted score	Weight in SC strategy	Ave. sustainability score	Sustainability score	Title	Relational resources and capability dimension
0.01280411	0.02977	0.43	0.6	VMI	Material flow management
			0.35	Pallet management system	
			0.35	Parts batch shipment system	
0.00756827	0.01240	0.61	0.75	Value engineering teams	Knowledge and information flow management
			0.5	Regular supplier site visits	
			0.5	Supplier suggestion systems	
			0.76	Common 6 sigma teams with suppliers	
			0.25	EDI with suppliers	
			0.71	Consistent IS between SAIPA and its suppliers	
			0.78	Logistics experience sharing committee with suppliers	
0.00171189	0.002481	0.69	0.7	Common planning committee	Interpersonal linkages management
			0.75	Common problem solving teams	
			0.45	Common training workshop with suppliers	
			0.85	Trust among SAIPA and its suppliers	
0.00736142	Average score of supply chain relational resources				

Table 11. Comparison of SC strategic resources and capabilities of IKCO and SAIPA

Sustainability score for relational resources	Sustainability score for internal resources	Value score for internal resources	Supply chain
0.009	0.16	0.25	IKCO
0.007	0.2	0.25	SAIPA

Anecdotal evidence from the interviews offers the hypothesis that the longer existence of IKCO has created a history of working together with suppliers. By contrast, SAIPA, being a newer company, it seems that has dedicated more resources to learn about best practices in internal processes from other companies in the industry. Such hypothesis, the influence of the age of the company on relational resources, could be an interesting subject for further research.

6. DISCUSSION AND CONCLUSIONS

As we stated in the research method section, there is a paradox in empirical RBV research (Gibbert 2006). We positioned our research as low idiosyncrasy and low generalizability in Figure 3. That is, we set out to develop a general framework for identifying and analyzing supply chain resources and then used it at auto industry to test the framework. Also we set out to find the resources specific to the Iran automotive industry at supply chain level. For this purpose we selected the resources that had a high score simultaneously in value and sustainability for internal resources and high score in sustainability in relational resources. They are as follows:

- Internal strategic resources for Iran's automotive supply chain
  - Procurement and SRM process: negotiation skills with suppliers, mutual trust and support culture among purchasing staff and teamwork, experienced labor in purchasing, good and visible working culture between OEM and procurement organization, working culture to prevent the production line interruptions due to stockout.
  - Supply chain planning and demand management process: inventory replenishment rate once in every four days, planning and demand management procedure in whole chain upstream.
  - Logistics and manufacturing flow management process: Kanban and synchronized production control procedure, employee knowledge of internal logistics, total production system, flexible manufacturing ability, experienced and knowledgeable manufacturing employees, assembly line sequencing ability, production process engineering abilities, high organizational commitment of production line staff.
- Relational strategic resources for Iran's automotive supply chain
  - Material flow management: VMI (Vendor-managed inventory), abilities for Kanban and synchronized production control with key suppliers.
  - Knowledge and information flow management: CPFR (collaborative planning, forecasting and replenishment), excellence council with key suppliers, common product development and improvement team, common improvement teams between OEM and its suppliers, value engineering teams, common 6 sigma teams with suppliers,

consistent IS between OEM and its suppliers, logistics experience sharing committee with suppliers.

- Inter-personal linkages management: clarity and benevolent culture among supply network, common problem solving abilities, trust between OEM and suppliers abroad, OEM's experienced manager as a main decision maker at suppliers, common planning committee, trust between OEM and its suppliers.

The main contribution of this research is to develop and apply a framework for analyzing supply chain strategic resources. This framework is incorporated into two levels of analysis: intra-organization and inter-organization. There is a danger that the relational approach of strategic management neglects the organizational level and the significance of resources of the embedded within firm boundaries, as is often the case in network literature (Duscheck 2004).

In this research we attempted to solve that challenge by using the supply chain level of analysis. As mentioned in the literature review, there are few studies in supply chain management using the RBV. So we tried to open a new avenue of research on supply chains based on RBV. Operationalizing the RBV concepts and conducting empirical research is an issue in strategic management studies that is still ongoing (Newbert, 2007). With the increasing tendency to look at the whole supply chain as a means of attaining competitive advantage, we need to shift empirical research to this new unit of competition. Another challenge is to try to find an approach to explain the potential of inter-organizational linkages to create sustainable competitive. In this research, we used the relational view and network theory to do so. Identifying the strategic resources and capabilities is the first step, and we need more research about how we can develop, protect, deploy and leverage those resources in a supply chain and develop the firm's and the supply chain's strategy based on these resources and capabilities. It is obvious that we need more research in this vein to explain supply chain performance and conduct based on its resources and capabilities. Another research path could be to apply the framework developed in this research to identify and analyze the strategic resources and capabilities in the downstream side of the supply chain.

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