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INTEGRATED CONCEPTUAL
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THE LINKAGE BETWEEN LIS AND RBV FOR SUSTAINED COMPETITIVE ADVANTAGE: AN INTEGRATED CONCEPTUAL MODEL

Susana G. Azevedo, João Ferreira

ABSTRACT - An important factor that guarantees a persistent competitive advantage is the sustainability of the firm's capabilities or their core competences. These capabilities should form the basic support of firm's strategy. Several authors point out the importance of the information systems (IS) for firm competitive advantage. The main tenet of this paper is to define a coherent theoretical framework of reference which will lead to a broader understanding of the relationship between Logistics Information Systems (LIS) and RBV in an integrating conceptual model for gaining and sustaining competitive advantages of firms. The paper argues that most failures of firms can be attributed to the fact that resources and capabilities of firms were either not existing or not addresses correctly. Neglecting IS linkage to resources and capabilities is one main reason for the failure. In this sense, a precondition for a sustained competitive advantage is to admit LIS as specific source of firms' distinctive competences.

Keywords: Information Systems; Logistics Information Systems; Resource-Based View (RBV), Competitive Advantage.

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1 INTRODUCTION

Understanding sources of sustained competitive advantage for firms has become a major area of research in the field of strategic management ([1]; [2]; [3]; [4]). Since the 1960s a single organising framework has been used to structure much of this research ([5]; [6]). Most research on sources of sustained competitive advantage has focused either on isolating a firm's opportunities and threats, describing its strengths and weaknesses ([6]; [7]), or analysing how these are matched to

choose strategies ([8]; [9]). There is little doubt that this approach has been very fertile in clarifying our understanding of the impact of a firm's environment on performance [1].

Many authors however have pointed out the importance of the Resource-based View (RBV) in clarifying the relationship between the type of resources firms have and their performance. The RBV argues that firms possess resources, a subset of which enables them to achieve competitive advantage, and a further subset which leads to superior long-term performance ([3]; [4]; [8]; [1]).

Resources that are valuable and rare and whose benefits can be appropriated by the owning (or controlling) firm provide it with a temporary competitive advantage. That advantage can be sustained over longer time

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periods to the extent that the firm is able to protect against resource imitation, transfer, or substitution.

But what the RBV theorists meant by a resource? They have used a variety of different terms to talk about a firm's resources, including competencies [10], skills [4], strategic assets ([11]; [12]), and stocks [13]. That is, they consider it as anything tangible or intangible the firm can use in its processes for creating, producing, and/or offering its products (goods or services) to a market. Besides resources, they give also a special highlith to the firm's capabilities considering them as repeatable patterns of actions in the use of resources to create, produce, and/or offer products to a market. Capabilities can include skills, such as technical or managerial ability, or processes, such as systems development or integration.

Resources can be either tangible (e.g., information systems hardware, network infrastructure) or intangible (e.g., software patents, strong vendor relationships) ([14]; [15]). In contrast, capabilities transform inputs into outputs of greater worth ([11]; [13]). According to Barney [3] the RBV rests on two fundamental assumptions. First, firms have productive resources and different firm possesses different resources. This is the assumption of firm resource heterogeneity. Second, some of these resources are either very costly to copy or inelastic in supply. This is the assumption of resource immobility.

The utilization of LIS could lead to the improvement of firm's responsiveness to the markets requirements and bringing the right products to the right place, in the right time in order to gaining and sustaining a competitive advantage [16].

Olavarrieta and Ellinger [17] identify several logistics distinctive capabilities which determining a sustained competitive

advantage, namely: team work capability, skills to manage relationships with suppliers, technological assets and competences of developing new products and services. In this sense, it is essential to develop strategies that use such resources and capabilities assuring to the firm a larger competitive advantage.

The main tenet of this paper is to define a coherent theoretical framework of reference which will lead to a broader understanding of the relationship between LIS and RBV in an integrating conceptual model for gaining and sustaining competitive advantages of firms.

In the next section of this paper a review of the RBV literature is presented. This is followed by a contribution of LIS as sources of sustained competitive advantage. In the fourth section is proposed a conceptual framework incorporating the linkage between RBV and LIS as determinants of firms gaining and sustaining competitive advantage. Finally a short summary of the main contributions of this study is given.

2. CONTRIBUTION OF RBV FOR A SUSTAINED COMPETITIVE ADVANTAGE

The most salient characteristic of the RVB is focus in the internal forces of firm. This approach is rather linked to the pioneering work of Penrose [8] than any other. Recently there has been a reinforced interest in role of firm resources as foundation for firm strategy ([4]; [18]). This interest reflects some dissatisfaction with the static, equilibrium framework of industrial organisation economics, where the focus was in the relationship between the strategy and the external environment [4]. Several advances have occurred on different strategic levels and all of them contributed to what has been

termed resources-based view. Basically, RBV describes a firm in terms of the resources that firm integrates. Penrose [8] accentuates the condition of a firm not be just an unit, but also a group of resources. Frequently, the term resource is limited to those attributes that enhance efficiency and effectiveness of the firm [1]. Miller and Shamsie [8] refer that resources should have some capability to generate profits or to avoid losses. A general resources' availability it will neutralize the firm' competitive advantage. Once, for a firm to take high levels of performance and a sustained competitive advantage, it needs to acquire heterogeneous resources and difficult to create, to substitute or to imitate by other firms.

According to Penrose [8], Wernerfelt [1], and Rumelt [19] a firm is a compilation of productive, tangible and intangible resources, assembled in a tool of administrative job. In this sense, this theory defends that, under imperfection of markets exists a diversity of firms and a variation in the specialisation degrees that provokes a limited transfer of resources which present type, magnitude and different nature [11]. Therefore, the main reason for firms grow and have success can be found inside of the firms, that is, firms with resources and superior capabilities will build up a basis for gaining and sustaining competitive advantage [20].

Several authors ([4]; [3]; [21]; [22]; [19]; [23]; [24]; [11]) when referring to the RBV, they do it more in a strategic context, presenting resources and capabilities as essential to gaining a sustained competitive advantage and, consequently, to a superior performance. However, these resources must have some characteristics, namely: (i) specialized ([25]; [26]; [11]); (ii) scarces ([3]; [23]; [25]; [26]; [11]; [27]); (iii) durables [4]; (iv) hard to trade ([25]; [26]; [11]; [27]); (v) costly to

copy ([3]; [11]); and (vi) valuables ([3], [23]; [27]).

Wernerfelt [1], Learned *et al.* [28] and Porter [2] adopted RBV from a strategic point of view considering a resource as a strength that firms can use to formulate and to implement their strategies. The resources and capabilities of the firm are the main competences for formulating strategy [4].

Some authors ([23]; [3]; [4]; [29]; [30]) enhance that resources are, by itself, insufficient for obtaining a sustained competitive advantage and a high performance well. According to them, this is possible only if the firms are able to transform resources in capabilities, and consequently in a positive performance [30]. Penrose [8] refers that the firms reach a superior performance, not because only they have more or better resources, but also because of their distinctive competences (those activities that a particular firm does better than any competing firms) allow to do better use of them.

Despite the wide diversity of resources, it is possible to classify it according to following categories: (i) Tangible and intangible resources ([14]; [11]; [8] and [31]); (ii) Strategic resources ([23]; [24]); (iii) Human resources [32]; (iv) Social resources [32]; (v) Organizational resources [32]; (vi) Technological resources [32]; (vii) Location resources [32]; (viii) Factor conditions ([17]; [4]; [3]; (ix) Assets ([23]; [3]; [11]); (x) Capabilities ([23]; [3]; [11]).

Regarding the capabilities, they are considered, for some authors, not only as firm's resources but also as competences ([8]; [33]; [10]; [34]; [35]) and invisible assets [15]. The concept of capabilities is frequently used to define a group of individual qualifications, assets and accumulated knowledge, exercised through organizational processes allowing to

coordinate activities and to use their resources ([11]; [23]; [36]).

According to Grant [4] there is a key distinction between resources and capabilities. Resources are inputs into the production process – they are the basic units of analysis. The individual resources of the firm include items of capital equipment, intellectual assets, patents, brand names, and so on. A capability is the capacity for a team of resources to perform some task or activity. While resources are the source of the firm's capabilities, capabilities are the main source of its competitive advantage. For Barney [3] these distinctions can be drawn in theory, but quite confused in practice.

The capabilities are many times developed either in functional areas or in combination of physical, humans or technological resources, controlled by the firm [11]. Capabilities together with the resources are the core competences on firm's strategy formulation and therefore constitute the firm's identity [4].

In fact, as refer Bogaert, *et al.* [31] how more capability is used, more it can be refined and more hard is to copy. This characteristic reflects the dynamic perspective associated to the capabilities [37]. In the dynamic perspective, capabilities approach is a theoretical stream inside of the RBV. This theory considers that, on one side, the firms are constantly creating new combinations of capabilities and, on other hand; the market competitors are continually improving their competences or imitating the most qualified competences from other firms. This approach puts emphasis on internal processes, assets, market position as restricting factors not only the capability to react but also the management capability to coordinating internal competences of the firms [38].

In addition, some authors [39] give special attention to technological competences as an important factor to influence, not only the sales' growth, but also the businesses' diversification and performance.

According to Grant [4] the managers must select an appropriate strategy in order to use more effectively the resources and the capabilities of the firms. In this sense, it is pointed out the following question: what extent the resources and the central capabilities are identified and applied in an strategic way to create a competitive advantage? Barney [3] developed the VRIO model structured in a series of four questions to be asked about the business activities a firm engages in: (i) the question of Values; (ii) the question of Rarity; (iii) the question of Imitability; and (iv) the question of Organisation. The answers to these questions determine whether a particular firm resource or capability is a strength or weakness. The VRIO model describes ways that firms can expect to be successful.

The RBV has also been used in information and communication technology field. This theory provides a valuable way of information systems' researchers to think about how information and communication systems relates to firm strategy and performance. In particular, the theory provides an important framework to evaluate the strategic value of information and communication technology resources. It also provides guidance on how to differentiate among various types of LIS [40].

Innovative applications of information systems and new requirements in terms of open organizations and more flexibility have created an environment where the old ways of working, no longer apply and new rules must be developed [41]. These new rules set the conditions within which firms can not only

operate but also to make strategic choices [42].

According to Wade and Hulland [43] information systems resources rarely contribute directly to the attainment of a sustained competitive advantage. They form part of a complex chain of assets and capabilities that jointly may lead to sustained performance. Information systems exert their influence on the firm through complementary relationships with other firm assets and capabilities. LIS resources by themselves are not enough to firms attain a sustained competitive advantage once they need also to have human resources with technical skills to make the wright use of them.

In Wade and Hulland [43] work is presented the following categorization of resources related with information systems, being as reference previous studies about this subject: (i) manage external relationships; (ii) market responsiveness and; (iii) manage internal relationships.

In the managed external relationships we can find IS that contribute to reforce community networks [44], to keep buying informed [45], to make possible the coordination of buyers and suppliers and also to increase customer service [46].

In market responsiveness, we can consider the IS that allow to faster the delivery [12] to increase market responsiveness [46], to increase the capacity to frequently update information [47], and to enhance the ability of firms to act quicly [49].

Into the management of internal relationships we can consider the IS that makes possible the integration of IT and business processes [48], the ones that allow build relationships [45], and the ones with the capacity to understand the effect of LIS on other business areas [48].

Wade and Hulland [43] propose also their own typology of IS resources classifying it as outside-in resources, spanning resources and also as inside-out resources.

The outside-in resources represent the ones that contribute to enhance the relationships between firms and external entities such as; suppliers [45], outsourcing partners ([48]; [45]), and customer ([49]; [46]). More, this kind of resources could also be used in a market responsiveness context. Market responsiveness involves both the collection of information from sources external to the firm as well as the dissemination of a firm's market intelligence across departments, and the organization's response to that learning ([23]; [50]).

The spanning resources represent the ones that have the capability of integration and alignment between the set of functional areas and departments of the firm. Many studies ([51]; [52]; [49]; [44]) recognize the importance of building relationships internally as a way of spanning the traditional gaps that exist between functions and departments, resulting in superior competitive position and firm performance. An element of this resource is the support for collaboration within the firm. The inside-out resources can be represented by infrastructures and technical skills. The infraestructure' resources have been studied by several studies ([48]; [47]) that recognize that many components of them convey no particular strategic benefit due to lack of rarity, ease of imitation, and ready mobility. So, the IS infrastructure resource has generally not been found to be a source of sustained competitive advantage for firms ([53]; [54]; [55]). As regards technical skills, they are a result of the appropriate, updated technology skills, relating to LIS that are held by the IS/IT employees of a firm ([49]; [12]). Such skills do not include only

current technical knowledge, but also the ability to deploy, use, and manage that knowledge. Thus, this resource is focused on technical skills that are advanced, complex, and, therefore, difficult to imitate. Although the relative mobility of IS/IT personnel tends to be high, some IS skills cannot be easily transferred ([49]) and technology integration skills ([45]), and, thus, these resources can become a source of sustained competitive advantage.

The RBV could also be applied to the logistical context. The logistics, through their distinctive capabilities, is an instrument of creation of time, place, form and ownership, inside of the firms ([16]). These capabilities are valuable, scarce and difficult to imitate [17] and, consequently, a source for creating a competitive advantage ([56]; [27]).

Competitive value of the resources can be enhanced or annulled by changes in the technology, by changes in the competitor's behaviour, or by changes in the buyers' needs. All these aspects would be neglectful whether the analysis focus was only centred in the internal resources [2]. According to Chandler and Hanks [29] resources and capabilities create a satisfactory base for formulating competitive strategies.

An important factor that assures a long term competitive advantage is the sustainability of the firm's capabilities or their core competences ([29]; [57]). Sustained capabilities are those that are not easy or quickly reproduced by the competitors and must form the base of firm's strategy. These resources and capabilities are the key for the achievement of competitive advantage and should be protected. Being so, they have a critical role in the competitive strategy of firms.

Olavarrieta and Ellinger [17] suggest some types of resources and capabilities, in

the logistical field, namely: the forklifts, the racks, the warehouses, the logistics facilities, the information and communication technologies and Electronic Data Interchange (EDI). As capabilities, in the extent of the logistics, suggest: the team work capability, the capability to manage relationships with suppliers, the technological capacities, the development of new products, the delivery service and the order fulfilment.

3. LOGISTICS INFORMATION SYSTEMS

Logistics information systems are defined as the people, equipment, and procedures used to gather, sort, analyze, evaluate, and distribute needed, timely and accurate information to decision makers [58]. In the knowledge-based economy, the rapidly changing and uncertain environment makes firms face the biggest challenge that how to break the current situations and to capture their competitive advantage.

The works of Parsons [59], Porter and Millar [60], Porter [2], McGaughey, *et al.* [61] and Constanza and Cynthia [62] pointed out the importance of the IS, in the determination of the firms' competitive advantage. According to Bowersox and Closs [63] this is due to the potential that IS seem to have on lower cost and better service offered.

According to Langley [64], the IS are important to logistics, since they make possible that the right information, be available at the right time and at the right place. Introna [65] demonstrates that while the logistics system converts materials into products, through the customer value, the information systems convert data into information, in order to facilitate managerial decision making. Both authors infer that information is a crucial resource that supports the decision making

process and that enhances logistics effectiveness, efficiency, and flexibility. Moreover, these factors provide the possibility of firms becoming more competitive.

The investment in state-of-the-art IS could be the main differentiator between leading edge logistics firms and average ones [66]. The Global Logistics Research Team [67] determined that IS is one of the seven capabilities that combine logistics process integration and world class performance. Adoption and successful implementation of IS is considered a prerequisite for logistics success.

Many researchers have found that IS are the most important tool for firms obtaining competitive advantages ([68]; [69]). Nixon [70] reinforces this vision, by suggesting that firms should employ LIS to raise their service capability in an E-business context. Mason-Jones and Towill [71] and Sauvage [72] also defend that firms improve their operational efficiency, through the continuous implementation of information systems according to their business characteristics.

There is no doubt that the IS is playing an important enabling role in logistics. Several surveys have been conducted to investigate the use and importance of IS in supporting logistics operations ([73]; [74]; [75]). Firms need to be able to manage information effectively, and to integrate several logistics activities by including inbound and outbound transportation, distribution, warehousing, and fleet management, in order to streamline the physical product flows of their customer firms [76].

Being in mind the RBV theory and particularly the categorization presented by Wade and Hulland [43], taking into consideration the literature revision we can consider the following categories of information

systems: (i) IS to manage external relationships (ii) IS to enhance market responsiveness; and (iii) IS to manage internal relationships.

In what concerns the IS to manage external relationships, in a logistics context, firms may appeal to supply chain optimisation systems [77], Integrated Logistics Information Management System (ILIMS) [78] Advanced planning and scheduling systems or ERP-II ([79]; [77]); Collaborative planning forecasting and replenishment systems ([80]; Supply chain optimisation systems [77].

As regards Logistics Information Systems to enhance market responsiveness firms can apply the following Electronic Point of Sale Systems (EPOS) ([81]; [77]), Electronic Data Interchange (EDI) ([82]; [83]).

Regarding LIS to manage internal relationships we can find in the following: production scheduling systems [77] Enterprise Resource Planning (ERP) ([77]; [84]; [85]; [79]); Transportation management systems (TMS) [77]; Tracking and tracing systems [85]; Warehouse management systems ([86]; [79]); Freight and fleet management systems (FFMS) [86].

The successful implementation of IS to support the several logistics processes is expected to bring a number of benefits to the firms [76]. According to Gutiérrez and Durán [74], Hammant [87] and Piplani *et al.* [75] these benefits could be translated by a reduction on errors from the entry of data and improvements in customer services.

Lai *et al.* [76] points out also that the use of IS makes possible that firms monitor the inventories, improve the utilization of their transportation and warehouse assets, and eliminate duplication of effort in performing different logistics activities. Many logistics managers consider IS as a major source of

improved productivity and competitiveness. They are also presented as a key component in the logistics systems [88].

Closs *et al.* [89] showed that IS capabilities significantly influence the overall competence of logistics. According to experts, no single factor seems to have greater potential to improve logistics operations than information communication technologies.

In fact, IS not only improve the effectiveness and efficiency of logistics processes, the successful implementation of LIS may have also a significant impact on logistics strategies and on organizational structure [90].

There are several benefits for firms when they use the IS, namely: (i) quick response and access to information; (ii) better customer service; (iii) increased competitiveness; (iv) reduction on data and data re-entry [76]; (v) faster data collection, processing and faster communication [88]; (vi) facilitate the inter-organizational dynamics [91].

The use of IS on logistics brings also an important impact on firms' competitive advantage [92]. Stock [93] illustrates examples of firms using logistics information systems to gain competitive advantage. Bourlakis and Bourlakis [94] defend a successful integration process between the logistics and the IS, since this kind of integration confer a competitive advantage upon retailers' distribution operations.

Drucker [95] believes that the IS and networking will be the key to organizational coordination. The direct impact upon logistics organizations of the future may be a reduction in formal structure with an increase in the networking of specialists. Executives at many firms have realized that it is no longer necessary to maintain total internal control over all phases of operations. Logistics

strategies can be implemented and performance goals realized through closer interactions and boundary spanning relationships with trading partners. The adoption of adequate IS could make it possible.

Much of the growth in outsourcing and external alliances will result from advances in communications capabilities including (EDI). The availability of timely, accurate information will allow firms to coordinate inter-organizational activities [96].

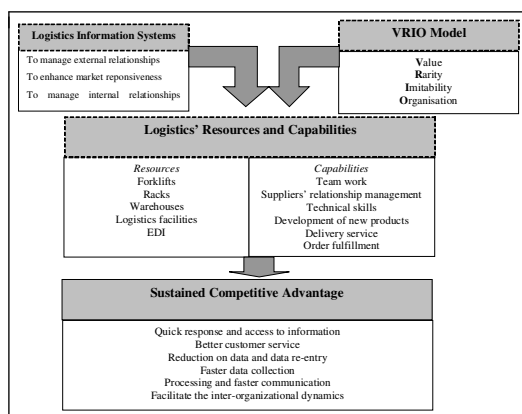
However, the process of IS adoption could be quite difficult to firms because of its requirements. The adoption of IS is, usually, associated with a large investment and firms may not have sufficient financial resources to support the high investment in hardware and software technology that is required [76]. Another factor that becomes difficult the IS adoption, form the part of the firms is the lack of technical skills support for implementing it.

4 - A CONCEPTUAL FRAMEWORK FOR ANALYSIS

The evaluation of firms' resources and capabilities is quite difficult to operationalise and not suitable to analyse the LIS (logistics information Systems) in gaining a firm's sustained competitive advantage. However, it is possible to overcome this limitation introducing the VRIO model proposed by Barney [3] to evaluate the strength of the resources and capabilities related with LIS (logistics information systems). In this sense we propose a conceptual framework (figure 1) composed by three dimensions of analysis that contributes for determining a sustaining competitive advantage: (i) LIS (Logistics information systems); (ii) VRIO model; and (iii) Logistics' resources and capabilities.

- (1) LIS (Logistics information systems) - it is characterised by the following set of variables: (i) IS to manage external relationships (ii) IS to enhance market responsiveness; and (iii) IS to manage internal relationships [43].
- (2) VRIO model – it reflects some questions about value, rarity, imitability and organization to understand the return potential associated with exploiting any of a firm's resource and/or capabilities [4].
- (3) Logistics' Resources and capabilities – it is characterised by a set of logistics distinctive capabilities and resources. Some of these resources are: forklifts; racks; warehouses; logistics facilities; and (EDI). The capabilities are: team work capability; capability to manage relationships with suppliers; technical skills; development of new products; delivery service; and order fulfilment [17].

FIGURE 1
LIS AND VRIO MODEL FOR SUSTAINED COMPETITIVE ADVANTAGE



These dimensions are determinants for gaining and sustaining competitive advantage according to following indicators: quick response and access to information; better customer service; reduction on data and data re-entry; faster data collection; processing and faster communication; and facilitate the inter-organizational dynamics.

5. CONCLUSÃO

This study presents three main contributions. First, the study enhances, according to RBV that there are four types of characteristics that resources must contain, as sources of competitive advantage: value, rarity, imitability and organisation.

Second, the study has suggested that firms with distinctive resources and capabilities make it more competitive. Furthermore, the logistics information systems are viewed also as important resources and capabilities which can guarantee a sustained competitive advantage. Through the intensive use of LIS firms can attain a better external relationship management, an increasing in market responsiveness and also a better internal relationships management.

Once the information flows becomes faster and efficient, making possible that the right information goes on to the right person and consequently making feasible that the right decision will be made. The adoption of LIS make possible that firms reach superior resources (logistics facilities, warehouses, forklifts, EDI) and also capabilities in what concerns suppliers' relationships management, development of new products, delivery service and also order fulfilment, because this become the resources and capabilities more value, rare and more dificul to imitate.

Third, the linkage between RBV and LIS, as a way of firms gaining a sustaining competitive advantage, in a conceptual framework, was discussed. The framework presented addresses important issues linked with strategic and IS research. In this sense, the study advocates that in many cases, the firms' strategy has not been so successful. In essence, most failures can be attributed to the fact that resources and capabilities of firms

were either not existing or not addresses correctly. Neglecting LIS linkage to resources and capabilities is one main reason for the failure. Precondition for a sustained competitive advantage is to admit LIS as specific sources of firms' distinctive competences in creating sustained competitive advantage.

Finally, in terms of guidelines for future research, we suggest the development of empirical studies, which may to apply this conceptual framework. In this sense, future studies may be developed in order to identify other dimensions that influence the competitive advantage obtained through the LIS adoption and RBV.

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