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A RESOURCE-BASED VIEW OF INFORMATION SYSTEMS:

A PROPOSAL FOR A RESOURCE BASED THEORY OF IS AND AN AGENDA FOR RESEARCH

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1. Introduction and overview

The resource-based view of the firm focusses on the firm's resources and capabilities in order to understand business strategy as anchored in the distinctive internal abilities of the firm, and also in order to guide the strategy formulation process. This paper explores the idea of putting Information Systems (IS) in this framework, with the goal of further developing a consistent understanding of the role of IS in the firm. This is consistent with recent efforts aimed at developing a better understanding of the firm's different functional activities in the light of the resource-based view (see, for example, Balakrishnan & Fox, 1993). Adopting the resource-based view is both fruitful and appropriate, as IS are a component of the firm's asset base and have already been analyzed from the environmental perspective in the past; see, for example, (MacFarlan 1984).

Putting IS in the resource-based framework has, right from the start, one important virtue: that of crediting IS and IS-related constructs with *the same* potential as any other of the firm's resources and capabilities, including *strategic* potential. This alone enriches the traditional view of IS and brings the idea of what is known as Strategic IS, or SIS, closer. On the other hand, the resource-based perspective lends itself to an explicit consideration of the *integration* of IS with the rest of the firm's resources, a fundamental characteristic of IS which has some very important implications for IS management and the organization of IS responsibilities in the firm. Finally, the resource-based view provides a new conceptual perspective, from which significant IS research issues can be viewed and understood a bit better. Consequently, research efforts aimed at analyzing such issues further can be proposed in ways that are consistent with the basic framework.

The paper is organized as follows: Section 2 contains a summary of the resource-based view of the firm, with an emphasis on the aspects that are most relevant to the discussion in this paper. More detail is given in the Appendix, where the role of the resource-based view in the business strategy formulation process is also described. Section 3 puts IS in the context of the resource-based framework and discusses how they can be conceptualized for the purpose of this paper. In fact, this section proposes a «resource-based theory of IS», discussing how IS concepts can be understood in the context of the basic resource-based framework. Section 4 discusses a few basic implications of the theory presented in Section 3 in general terms, but using some examples to make the central argument more concrete.

Section 5 further explores the implications, focussing on what might be called «conventional IS wisdom» and how it fits or fails to fit in the context of the resource-based theory. Section 6 briefly discusses implications for IS management and IS teaching, and proposes a number of topics for research which configure a research agenda for the resource-based view of IS. Finally, Section 7 is a short conclusion which summarizes the paper.

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2. The resource-based view of the firm: A summary

Several concepts that have been developed in connection with the so-called resource-based view of the firm (see Appendix) will be useful for the purposes of this paper. This section deals briefly with the most important of these concepts and offers concrete definitions that will be used in subsequent sections, where IS are examined in light of the resource-based view.

According to the resource-based view, firms seek to acquire valuable, hard-to-imitate resources and capabilities. As (Amit & Schoemaker, 1993) put it:

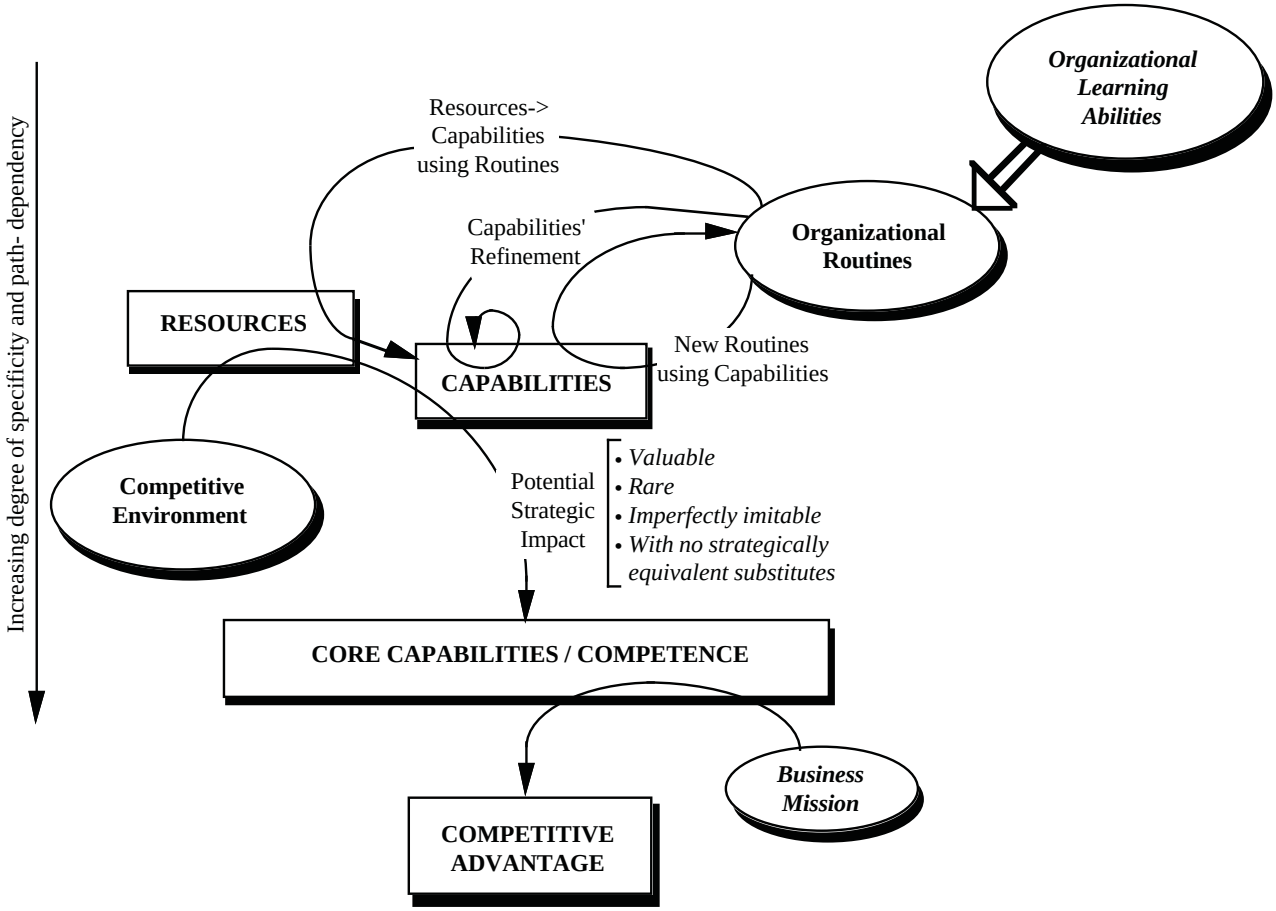
> «For managers the challenge is to identify, develop, protect and deploy resources and capabilities in a way that provides the firm with a sustainable competitive advantage and, thereby, a superior return on capital.»

The firm's quest for differentiation and superior rents is thus conceptualized as a process of developing distinctive resources and capabilities. In this paper, this process will be understood as described below. The role of «organizational routines» is central to any understanding of the dynamics of the process.

The process whereby a firm develops distinctive resources and capabilities can be described with the aid of the following concepts, which are presented and defined in the following paragraphs: *organizational routine, resource, capability, core capability, potential strategic impact, path-* or *acquisition-dependency,* and *degree of specificity.*

Figure 1 below illustrates the relationships between these concepts. For the sake of completeness, the concepts of «organizational learning abilities» and «business mission» have been included, although they will not be discussed in this paper.

Figure 1. From resources to competitive advantage



The main idea in Figure 1 is the evolutionary and dynamic nature of the multiple interrelationships among resources, capabilities and organizational routines. As an organization evolves, resources may be acquired (even in the most literal sense of the word), while capabilities and organizational routines are developed, using basic abilities to start with. Sets of resources can be coordinated through organizational routines to give rise to capabilities, which in turn can be made more sophisticated by combining them to produce new capabilities, again with the aid of organizational routines. It is also possible to develop new organizational routines by combining old routines with the aid of available capabilities. At any given point in time, the organization is characterized by the specific and interrelated sets or «stocks» of resources, capabilities and organizational routines that it has at its disposal. The processes whereby these stocks evolve are complex and are not necessarily planned; they may just happen. Planning the process, however, and making it happen are genuine management activities aimed at developing distinctive assets that lead to competitive advantage. For example, when confronted with conditions in the competitive environment, a firm may identify gaps in its set of core capabilities and accordingly detect a need for certain specific capabilities; this may trigger efforts to develop new organizational routines, or even learning abilities, and so on.

In summary, the fundamental idea is that any single component of a firm's set of resources, capabilities and organizational routines, or any combination of components, can have strategic impact in the context of a concrete competitive environment and company mission. The dynamics shown in the diagram are relevant for this paper to the extent that IS can contribute to them (positively or negatively).

In order to make the rest of the paper easier to understand, formal definitions of the concepts used in Figure 1 are given below. These definitions will be used in the following sections to explore the role of IS in the firm according to the resource-based view, and thus lay the foundations for a «resource-based theory of IS».

Key concepts defined

An *organizational routine* is a particular way of doing certain things, one that a given organization has developed and *learned,* and in which the organization is both very effective and very efficient, to the point where it has become almost automatic, a «natural» reflection of the «character» of the firm. (This does not imply, however, that there are well structured procedures that would allow the routines to be easily copied and «transported»).

A *resource* is any available factor owned or controlled by a firm (Amit & Schoemaker, 1993). More formally, a firm's resources at a given time could be defined as those (tangible and intangible) assets which are tied semipermanently to the firm (Wernerfelt, 1984). For the purposes of this paper, we shall say that resources are the assets available to the firm at any given time without the firm having to make any specific organizational effort to acquire them. In the sense of (Amit & Schoemaker, 1993), there are markets where resources can be traded.

A *capability* will be understood, in this paper, as a set of resources and/or capabilities combined in such a way that they behave like a well organized system, which means that they coordinate and cooperate with each other in a semi-automatic way (i.e., in a way which does not need to be consciously «reengineered» every time the capability has to be used, although some «reengineering» might be required when there are significant changes in the environment or in the resources themselves). Capabilities can be developed with the aid of organizational routines, they can result in organizational routines, they can embed such routines, and they can contribute to the formation of a routine. The distinction between a «resource» and a «capability» is important in the context of this paper because IS can be viewed either as a resource (more or less in the traditional way) or as an ingredient for developing a capability, which is a richer view that broadens the IS outlook. In particular, different parts or components of an IS can in effect play the role of either resources or capabilities, or can contribute to the development of capabilities. The «resource-based theory of IS» put forward in Section 3 below attempts to explore what can be derived from this view of IS, which offers fresh insights into the role of IS in the firm.

Core capabilities are capabilities that differentiate a company strategically in the sense that they foster beneficial behaviors that are not observed in competing firms (Leonard-Barton, 1992a). One way of making this concept more operative is through the idea of the *potential strategic impact* of a capability. A capability can be said to have *potential strategic impact,* and therefore to become a core capability or competence with the potential to provide competitive advantage, when it is *valuable, rare (scarce)* and *imperfectly imitable;* when it has *no strategically equivalent substitutes* in Barney's sense (see Appendix); and when it is *appropriable* by the firm, in the sense, for example, of not being tied to a particular

employee, who may leave the company. See, for example, (Leonard-Barton, 1992b), where the CEO of Chaparral Steel is quoted as saying that he can tour competitors through the plant, show them almost «*everything*, and we will be giving away *nothing* because they can't take it home with them». The concept of *fungibility* (i.e., being usable in very different contexts) is also sometimes considered a relevant attribute for resources and capabilities.

A resource, capability or core capability is said to be *path-dependent* or *acquisition-dependent* if the process whereby a given organization acquired it involved a significant degree of organizational learning, thus implying that imitating the process would by no means be easy or quick, as it would require changes in habits, knowledge and organizational culture, or even structure. Given the above definitions, capabilities and core capabilities will normally exhibit higher degrees of path-dependency than resources.

Finally, the *degree of specificity* of a resource or capability is the extent to which that resource or capability becomes inefficient or ineffective when it is used for purposes other than those for which it was originally developed. Again, capabilities and core capabilities will normally exhibit higher degrees of specificity than the resources on which they are based.

In general, the degree of specificity and path-dependency will increase from top to bottom in Figure 1, as more learning and selection are involved.

3. A proposal for a resource-based theory of Information Systems

The purpose of this section is to suggest how the concepts outlined in the preceding section can throw light on the Information Systems field. The idea of considering IS as one of the firm's resources is not new, although often the emphasis has been on seeing *information* as a corporate asset that has to be managed through an information system. One exception is (Barney 1991), who devotes a separate section to «Information Processing Systems and Sustained Competitive Advantage». In Barney's words, «an information processing system that is deeply embedded in a firm's informal and formal management decision-making processes may hold the potential of sustained competitive advantage». The implications of this statement are further pursued below. The thesis of this paper is that applying the resource-based framework to IS provides a number of insights into the role of IS in the firm. It is in this sense that this proposal for a «resource-based theory of IS» is put forward.

Information Systems defined

In order to formulate such a theory, a working definition of IS is needed. For the purposes of this paper, the following definition will be used:

> «An IS is the set of *formal* processes which compile, store, elaborate and distribute *part* of the information needed for the running of an organization and the associated management and control activities, and which support, at least in part, the decision-making and learning activities that are needed in order to perform the corresponding organizational functions.» (See Andreu, Ricart & Valor 1992.)

It should be understood that only the *formal* part of IS is included in this definition, as is normally and implicitly the case in the IS field (i.e., informal IS processes such as

interpersonal communication in meetings are not included, although this does not mean to say that these informal processes are not important). Furthermore, we are talking not only about *control* IS, but about any kind of formal information manipulating process that is *necessary* for the functioning of an organization. «Necessary» here means necessary for doing whatever is considered appropriate in order to attain the organization's goals; in particular, developing valuable capabilities with potential strategic impact.

According to this definition, the IS is part of the firm's *organization*, which includes (formal and informal) decision and learning processes, organizational structure, all the so-called management systems, and the organizational culture. The mission of the firm's *organization* is to coordinate the firm's different activities, motivate the firm's people, and foster organizational learning in order to attain the firm's goals (1). In this context, IS gather and distribute information not only from and to all the firm's activities, but also from and to the environment. Thus, from an operational viewpoint, the IS is one of the most dependent systems in the firm's organization, with high potential for being an active player in the resources–capabilities–organizational routines interrelationships depicted in Figure 1 above.

The role of Information Technology (IT)

Today, it is not appropriate to talk about IS in the above sense without taking IT into account. In effect, most (not to say all) information systems in operation today function with the aid of IT. Not only that: in some cases, IT has made possible (parts of) the IS that would have been impossible without it (think, for example, of the way clients interact with their banks' information systems through ATMs). This has always been so with IS and available technology, be it IT or whatever, and will probably continue to be so in the future. For this reason, in this paper we shall talk about the IT/IS combination, referring to it loosely as IS, as is often done in the field.

Thus, IT is seen as an enabling technology that makes it possible for a given IS to accomplish its objectives. It is important to note, however, that IT may also play the role of a constraint, in the sense of «not being enabling enough» (i.e., not making it possible for the IS to do what we would like it to do from the organizational or business perspective).

Resources, Capabilities, Organizational Routines and IS

In the light of the above definitions, we can now explore the way the main ideas of the resource-based view of the firm can help understand IS and their role in the firm.

Two basic approaches are relevant in this respect. On the one hand, one can study the resources, capabilities and organizational routines that are needed in order to develop an IS as such. Alternatively, one can study the role of the IS in developing capabilities and organizational routines that are needed not for the IS itself, but for other activities in the value chain (Porter, 1986), be they primary or support activities.

Viewing the IS as part of the firm's organization brings these two approaches together naturally: since the *raison d'être* of the IS is to support and coordinate the firm's activities, it will never itself originate any needs in the above sense. In other words, the objective of a firm will never be to have such and such an IS; rather, the firm's objectives will *imply* the need for an IS, precisely in order to develop valuable capabilities by coordinating the firm's various activities (2). That is why we shall concentrate here on resources,

capabilities and organizational routines that are relevant for the development and functioning of the firm's IS, and then on the degree of specificity and the potential strategic impact of the outcomes (many of them consisting not only of IS elements, but also of other activities *combined and coordinated* with the aid of the IS) (3). One way of conceptualizing the following sections is to think about how an IS can help make the transformations in Figure 1 actually happen, leading eventually to competitive advantage. When a firm's IS is conceived, designed and implemented in such a way as to assist the evolutionary process that goes from resources to capabilities and eventually to competitive advantage, it can make an effective and significant contribution to the development of a valuable resources/capabilities base. This is precisely the core subject of this paper.

IS Resources

The following elements can be considered relevant resources for the development and functioning of the IS in a firm (that is, assets that are relevant to the IS but that are available to the firm without any special effort):

- The available IT (under certain conditions –of functionality and cost, for example). This should be understood to include the whole collection of technologies that are available in a firm at a given point in time (computing and communications hardware, a wide range of software that includes basic packages as well as techniques such as artificial intelligence or expert systems know-how, etc.).

- Relevant data and information available inside the firm, mainly as a result of transactions between the firm's different activities (or between the firm's activities and the environment), transactions that are needed simply in order to coordinate the activities, so that the firm's operations are carried out as they should be. For example, data on clients or orders, on plant capacity for production scheduling purposes, on stock levels, etc. This should be understood to include data and information that is generated as a result of the learning processes whereby the firm develops capabilities and routines, which might be considered relevant or potentially valuable for the further development of capabilities and routines in the future. Although this sort of data is not as routinely gathered and stored as that produced by transactions, it can have great potential and maybe *should* be routinely gathered for the purposes mentioned here.

- Relevant data and information available outside the firm. For example, data about market conditions, consumer behavior or competitors' activities, again under certain conditions (e.g., degree of detail, cost, timeliness). If the effort, cost or routine needed to secure access to such information is considered not trivial, then having access to that information should be conceptualized as a *capability* rather than as a resource, as the organization has to learn something in order to acquire it. It will normally be clear in each specific case what is a resource and what is a capability.

- Basic and potentially useful data and information manipulation procedures, whether supported by IT or not. For example, the ability to store and retrieve data and information given some of their contents, the ability to exchange data between activities, the ability to summarize data through statistical indicators, the ability to

forecast sales using historical data and market indicators, and so on. As above, depending on the degree of sophistication of these procedures, the level of training of the firm's employees (who may thus be considered as «depositories» of the procedures and routines), and the organizational routines and culture present at a given moment in time, some of these procedures might be considered *capabilities* rather than resources. Again, in each case it will be clear which are which.

IS Capabilities

The following IS constructs can be conceptualized as capabilities (that is, as well organized and coordinated sets of resources and other capabilities):

- Easy access to relevant data and information elaborated from data and information resources through the use of available procedures, be they resources or capabilities (see below). By «relevant» we mean «potentially useful for improving the firm's activities», where the improvement may take either of two forms: greater efficiency (that is, needing fewer resources for the same functionality) or greater effectiveness (that is, improving the activities' functionality itself, e.g. by making them more coherent with the firm's objectives, or better aligned with the firm's strategy).

- Data and information manipulation procedures (IT-based or otherwise) that are useful for the purposes described in the preceding point, acquired through a process of learning. The learning involves knowing how to actually implement the procedures (for example, knowing how to use basic forecasting or expert systems techniques), as well as organizational learning that leads to an effective «organizational interiorization» of the procedures, in the sense of knowing how to use them in the context of the firm's operations and problems. The latter clearly requires that there be the appropriate organizational routines (see the corresponding subsection below).

- «Information subsystems» that are useful for improving the firm's activities, in the sense of well integrated data and information resources, capabilities and manipulation procedures that function as an organized whole. This is simply a combination of the two previous points and is included for the sake of completeness.

- The IS as understood in this paper, as the coordinated set of subsystems effectively operating in a firm at a given point in time.

In addition to the above capabilities, the following should be also considered in order to account for important roles of IS in the firm:

IS-related Capabilities

- Well coordinated <primary value chain activities - information subsystems> combinations. By this we mean the effective integration of the firm's activities and some of the IS subsystems that can function semiautomatically as a coordinated whole and that do not need special attention from the organization or its components (in particular, persons and organizational structure and

routines, once implemented and in operation) in its day-to-day operation. Well-known examples of this would be the American Hospital Supply (now Baxter Healthcare) ASAP system, the Federal Express COSMOS system (Smith, 1991), or, in general, production planning and scheduling DSSs, etc.

– Well established <support value chain activities - information subsystems> combinations. By this we mean the same as in the preceding point but with reference to support activities of the value chain. For instance, IS support to the firm's control system (sometimes, even today, taken as the only IS role in a firm), all kinds of DSS (when they refer to management activities) and EIS (see, for example, Rockart & de Long, 1988).

It should be noted that there is a certain degree of interdependence between the capabilities included in this subsection and those in the previous one. In effect, the procedures and subsystems described there were presumed to be «useful for improving the firm's activities», while the combinations included in this subsection are explicitly linked to specific activities, thus materializing that improvement. In this sense, this subsection might be considered redundant. We nevertheless include it because we find it a useful conceptual complement.

In addition, the framework depicted in Figure 1 suggests a more far-reaching type of IS-related capability, which in turn widens the traditional scope of IS. It has to do with the idea of *IS support specifically conceived and designed for the purpose of facilitating the transitions shown in Figure 1*. Thus,

– Information subsystems designed to support the firm's capability development process. There seem to be few such subsystems in existence today. However, data gathered during the continuous process of capability development could conceivably be stored and made available for future processes of the same kind in order to assist the learning process. Tools such as knowledge-based procedures and similar artificial intelligence techniques (in particular, the so-called *case-based reasoning,* or CBR) can be of use here, as can other less sophisticated approaches (e.g., documenting experiences in much the same way that experimental scientific research is documented in lab notebooks).

IS-related Core Capabilities

According to Figure 1, capabilities become core capabilities when they have potential strategic impact. In order to check that this condition is fulfilled according to the definition of strategic impact given in the previous section, it is necessary to take the conditions of the competitive environment into account. In this paper we use Barney's concepts of *value, rarity, imitability,* and *strategic substitutability,* together with that of *appropriability,* for this purpose (see Appendix). As no concrete environmental conditions can be brought into play in general, talking about potential strategic impact for capabilities in general is very difficult. That is why we simply repeat here the concepts presented in the Appendix; applying them to specific situations should not be a problem in principle.

Thus, IS and IS-related capabilities, like any other capabilities, can become core capabilities when (using Barney's criteria):

– They exploit opportunities and/or neutralize threats in a firm's competitive environment *(are valuable);*

- They are not possessed by more than the number of firms needed to generate perfect competition dynamics in the industry *(are rare);*

- They are *not perfectly imitable*, that is, when they exhibit path-dependency, when the link between them and the competitive advantage is causally ambiguous, or when they are socially (or organizationally) complex;

- They *do not have strategically equivalent substitutes*, i.e. what they achieve (exploiting opportunities, etc.) cannot be achieved in any other (known or equally effective) way.

From these conditions it is clear that path-dependency plays a major role in making simple capabilities into core capabilities, including the path-dependency resulting from making capabilities *valuable* in the above sense. In turn, this implies a high degree of specificity, as capabilities have to be related to a specific environment. This makes sense, since otherwise the capabilities would not be rare in Barney's sense. To achieve all this, a number of organizational routines are needed. We therefore turn to this topic next.

IS organizational routines

The organizational routines described below are those needed for developing IS that, in the above sense, become capabilities and core capabilities. Most of them are traditional IS development abilities, which, when seen from the organizational routine perspective, acquire added meaning. The following seem relevant:

- Ability to plan an IS. This should be understood to include planning that seeks to align the IS with the firm's strategy (see, for example, Henderson & Venkatraman, 1991), as well as planning that seeks strategic advantage, sometimes called *proactive* IS strategic planning (see, for example, Andreu, Ricart & Valor, 1992).

- Ability to design an IS according to a plan. This includes both the technical ability to draw the physical blueprints for an IS (for example, the necessary DBs, processes, IT infrastructure, and the like) and, more importantly in this context, the *organizational design* needed to make the designed IS really useful in the sense of being integrated with the firm's activities in an effective way.

- Ability to implement an IS. Again, this includes both the technical implementation side and the organizational implementation side, which may even involve making changes to the organizational structure of the firm. Acquiring this ability and the preceding one is not easy and may involve a non-trivial amount of organizational learning. Walton, for example, provides a good insight into what is meant here. (4)

- Ability to maintain an IS as the firm's activities, knowledge, skills, strategy and organizational structure evolve. Again, the two dimensions (technical and organizational) are present.

- Ability to use an IS effectively, for the purpose it was conceived, designed and implemented. Again, the two dimensions are present. This ability involves the day-to-day use of the IS, making sure that it serves its original purpose.

In addition, the IS can play an active role in putting together other organizational routines, for example through combinations of the firm's activities and the IS support mentioned above under the heading of IS-related capabilities. Classifying such combinations of activities as capabilities or as organizational routines is largely a mater of taste and choice, but sometimes they fit better under the heading of organizational routines, e.g. when IS-embedded procedures contribute significantly to making a new organizational structure, control system or activity operative in the firm. This is why the following item is included in this list.

– IS-related organizational routines: Organizational routines of any kind made possible and effectively implemented largely through IS support. For example, the observation that «implementing this IS forced us to organize better», sometimes heard in connection with IS implementation, is an instance of what is meant here. More fundamentally, the idea of IS-based support in the capability development processes is directly relevant to this point.

When IS are developed, implemented and operated using the above routines, the resulting IS, and the various combinations of those IS with the activities that they support, can have different degrees of specificity. Since the higher the degree of specificity the higher the potential strategic impact, we now turn to a brief discussion of the latter.

Specificity degrees of IS and IS-coordinated activities

The following should be understood as criteria for deciding «how far a given IS is from being truly operational in a given organization». The result of applying these criteria will thus depend upon each specific organization or firm. For the sake of convenience and simplicity, the criteria are directly related to the organizational routines described above. They are:

– The IS can be used simply by «putting it to work». No special effort has to be made (e.g. no organizational changes are needed) to «interiorize» it. The specifity of such an IS would be very low. Many payroll IS would fall into this category.

– Just putting the IS to work will not suffice; it has to be maintained in response to changes in the firm itself or in the environment in order to be truly effective. Depending on the IS and the changes to which it will have to adapt, this criterion will be more or less relevant. To continue with the same example, a payroll system which requires maintenance only in response to well structured changes in the environment (labor-related laws, etc.) can be bought with a maintenance contract, which effectively frees the firm from the maintenance burden; in a case like this, the relevance of this criterion would be very slight.

– Putting the IS to work will require organizational changes, e.g. because it effectively increases the degree of centralization of certain decisions, which in turn implies a new organizational structure and control system (5). When this kind of organizational adaptation is needed for the effective functioning of an IS, its degree of specificity increases considerably. Once such an IS is in operation in a given organization, copying its functionality in another organization that has not made the same sort of organizational changes will not be easy in general.

– The IS requires further design, both physical and organizational, quite apart from the efforts needed to implement it. One important kind of organizational redesign that might be needed in this context is the redesign of some of the firm's activities in order to make effective use of the resulting activities–IS combination. This corresponds in part to what in recent years has been called «reengineering» (Hammer, 1990), (Venkatraman, 1991), (Davenport & Short, 1990).

– The IS needs to be planned, i.e. it needs to be put in the context of the firm's strategy and made consistent with it, and the changes, possibly in both the IS and the strategy, that are needed in order to achieve a good organizational and competitive fit have to be planned.

Although this set of criteria may seem to be hierarchically organized (in the sense that if a lot of effort is required in order to plan an IS, then designing, impementing and using the IS will also require considerable effort), this is not necessarily the case in general. For example, once the organizational changes have been made, putting a relatively simple DSS to work may be very easy. Thus, the above list should be taken as a checklist that can help to think about the specificity degree of a given IS. For example, one might see an IS functioning well in a competitor's organization and be tempted to copy it right away. Considering such a move in the light of the above criteria may reveal difficulties that were not apparent at first glance.

Summary

Seeing IS from the resource-based perspective makes it possible to organize different IS-related constructs in the categories employed above, namely resources, capabilities, core capabilities and organizational routines, giving rise to different degrees of specificity. Conceptualizing these different categories in the context of a framework such as that illustrated in Figure 1 also makes it possible to describe in a consistent manner how the different constructs relate to one another and evolve in order to meet the firm's needs in the broadest sense, perhaps even leading eventually to competitive advantage. Both these views (the categorization and the dynamics associated with the interrelationships depicted in Figure 1 when applied to IS-related concepts) are useful for developing an illuminating vision of the role of IS in the firm. In the following sections this view is exploited and a few implications are drawn from its application to classic IS-related issues. An agenda for research follows naturally from these implications.

4. Basic implications of a resource-based view of IS

This section explores the immediate implications of the resource-based theory of IS outlined in Section 3. Distinguishing between resources, capabilities, etc. and understanding how they evolve with the support of organizational routines brings together, in a unified and consistent way, IS issues which have often been treated in isolation.

Simply as an introductory example, take certain issues belonging to the two most obvious realms of the IS field, the technological realm and the organizational realm. Consider the example of a firm that possesses assets and skills that enable it to use CASE techniques in developing software applications needed for IS implementation. By and large, such assets

and techniques are seen as technological productivity tools, and the decisions associated with acquiring these assets and techniques, including the training of the personnel involved, are often considered almost exclusively from that perspective. However, seeing them as organizational routines that enable the development of capabilities (not only strict IS capabilities, but business capabilities –see previous section) brings those skills to the same level as other «pure business» organizational capabilities, and consequently to the closer attention, for example, of the human resources development objectives and programs of the firm as a whole. Walton's framework (Walton, 1989) is largely consistent with this view and so can be considered, from the standpoint of this paper, as a very useful way of making some of the ideas proposed here operational.

More systematically, the basic implications of the theory outlined in the preceding section can be described as follows.

IS *resources* provide the *basis*, as they *enable* the development of more sophisticated constructs such as capabilities and so on. Seeing IT as an enabling technology is fully consistent with this view.

Resources in this sense, though, are not enough. Anything *useful* in the context of the firm's activities and objectives is at least a *capability*. We described a series of IS and IT-related capabilities above, but let us not forget the capability *concept*: it involves combining sets of resources, other capabilities and organizational routines into a well structured *system* that is useful for the firm in its quest for differentation and superior rents. So it is not a matter of simply putting a number of resources together. There are organizational routines involved, which may depend a lot on the firm's own idiosyncrasies. And this makes the specificity degree go up. i.e., the more *useful* IS are, the higher their degree of specificity. In other words: high-potential IS will *not* be those involving the straightforward use of a commodity technology (a *resource*) through a standard software package, mainly if the latter can be simply «plugged in» and used (that is, with a low specificity degree –see Section 3). Here it should be noted that making a good diagnosis of the corresponding specificity degre is crucial: mistaking a highly specific IS for one with low specificity will lead to serious implementation problems, consistent with traditional IS wisdom, as noted below. Also, IS support of the capability development process and organizational routines themselves will generally involve high degrees of specificity and will therefore have potential for eventually developing competitive advantage.

Next come *core capabilities*. Adding potential strategic impact to capabilities further builds on the capability base of the firm at a given point in time, matching them to the conditions of the competitive environment. In the IS field, this means developing potential for eventually obtaining IS-based or IS-supported competitive advantages –i.e. getting IS closer to the so-called Strategic Information Systems, or SIS (Business Week, 1985; Sunnot, 1987; Wiseman, 1985).

As described above, several conditions have to be met in order for a capability to become core. One of them has to do with not being perfectly imitable, and this, in turn, may come about because the «link between the capability and competitive advantage is causually ambiguous» (Barney, 1991). In other words, when that link is not well understood, it is difficult to imitate. But, since it is not well understood by the firm getting the advantage either, it probably follows that *in such cases* the only way to actually develop IS that lead to competitive advantage is through «incrementalism» or «bricolage» (Vitale, Ives & Beath; Cash & Gogan, 1987; Ciborra, 1991).

When the link between a capability (an IS-related capability, in particular) and competitive advantage is not causally ambiguous, that capability may still lead to sustainable advantage if it can be made not perfectly imitable by other means. For example, through path-dependency or through organizational or social complexity (Barney, 1991), i.e. by increasing its degree of specificity. This might be achieved, for instance, by exploiting and increasing its links to the firm's idiosyncrasy, both internally (using specific and characteristic organizational routines) and externally (exploiting the firm's opportunities in the environment and avoiding threats *vis-a-vis* competitors). This amounts to conscious, explicit planning. Furthermore, it is clear that such planning must allow for the explicit consideration of environmental conditions and be consistent with the competitive positioning of the firm, i.e. the planning should be done *in conjunction with the firm's business strategy design process*, since it is during this process that all the relevant variables are readily available. The conclusion, therefore, is that it is possible to plan for SIS and that this should be done in conjunction with the business strategy design process. This is consistent with proposals such as that put forward in (Andreu, Ricart & Valor, 1992) (6).

Also, the results achieved through SIS and documented in the literature can be clearly explained with the aid of the resource-based theory. Consider, for example, the ASAP system developed by American Hospital Supply and now used by Baxter Healthcare. The system included interesting functional and technical details for its time, but one important point is that ASAP *effectively contributed to the positioning of AHS as the «prime vendor»* (see Short & Venkatraman, 1992) for hospitals in a competitive environment w*here very important competitors (for example, Johnson & Johnson) just could not play the same game, at least in the short run: they were organized in too many divisions were and too decentralized to respond quickly enough*. This can be described, with the aid of the theory, as ASAP having achieved a high degree of specificity by being closely tied to the competitive positioning of the firm and, at the same time, exploiting a clear environmental opportunity: that of the so-called «incumbent's inertia» on the part of a major competitor, namely the highly decentralized Johnson & Johnson. In other words, a hard-to-imitate organizational and competitive positioning fit was built into the system, which in this way became a major ingredient in the firm's arsenal of core capabilities, leading to competitive advantage. Furthermore, the evolution of this same system led to a shift in «distinctive business competence» (Short & Venkatraman, 1992) that helped to sustain competitive advantage.

As another, more general type of example, consider the apparent paradox of several SIS being based on transactional, or operational, IS (Andreu, Ricart & Valor, 1991). In most of these cases, the advantages came not from being able to make the operational IS function more efficiently, but from a more fundamental organizational and/or competitive positioning fit of these transactional IS. Thus, the paradox is only apparent, and the conclusions in (Andreu, Ricart & Valor, 1991) still apply.

Yet another example: ATMs can be considered a commodity today, including the systems and complementary hardware needed for their operation. Most financial institutions the world over use them almost routinely, so we could say they all have that technology readily available as part of their resource base. Some institutions, though, have developed capabilities based on the ATMs that go beyond the straightforward cash dispensing function. For example, one Spanish savings bank has recently announced that its clients can now use its ATMs to buy forfaits for a weekend of skiing in different places, including hotel accomodations. This involves managing inventories of something which is not as general purpose as cash, although it involves also charging the account of the person buying the forfait. Does this capability have the potential strategic impact to become core? The answer to this question is less obvious than if it referred to the cash dipensing function only. It

depends, among other things, on whether the competitors of that savings bank are willing to enter, or have access to, the winter vacation market.

As expected, as we move from resources to capabilities to core capabilities and eventually to competitive adavantage, we move farther and farther away from what has traditionally been understood as IS, and the important part of the resulting capabilities are to an increasing degree the organizational and competitive complements. And, the degree of specificity goes up accordingly. Making IS and IS related constructs more specific in this sense results in a decreased degree of *mobility*, i.e. in them being less and less generally applicable. There is a message here for the so-called standard IS, and for software packages conceived and sold to implement standard IS. From another perspective, a high degree of specificity involves having investments tied up in capabilities, and therefore the *appropriability* of the capabilities should be ensured (e.g., by making sure that the organization as a whole acquires the capabilities, not only one person or a select few who could leave the company and take the capabilities with them). For the same reason, capabilities with high degrees of specificity carry a risk of *hold-up*, i.e. of being tied to them without the capacity to react to rapid changes in the environment, for example. This implies the need to continously develop the appropriate capabilities in response to environmental conditions.

5. Conventional IS wisdom in the context of the resource-based theory

The purpose of this section is to informally check the coherence of what might be called «traditional IS wisdom» against the theory proposed above. By «traditional IS wisdom» we mean those IS issues, concepts, frameworks and rationales that with time have become commonly accepted in the field, either because they have been explicitly tested or because experience has shown them to be generally valid. We are by no means trying to be complete, however: the goal is simply to show that the theory encompasses many of the traditional issues in an organized way.

We shall start by comparing the general IS framework with the structure of the theory, and then analyze the theory's components in turn, relating them to well-known issues and rationales.

Structure and findings of the «Management in the 1990s Research Program»

The recent «Management in the 1990s Research Program» (Scott Morton, 1991) used a basic framework and obtained a set of results whose structure is largely consistent with the theory proposed here. The program was aimed at «investigating the *impact* of the new information technologies (IT) on organizations, with the goal of determining how the organizations of the 1990s –and beyond– will differ from those of today», which clearly ties in with the subject of this paper.

The basic framework used in the program viewed an organization as consisting of five sets of forces in dynamic equilibrium. These forces were «management processes», «strategy», «structure», «individuals and roles», and «technology». They were conceived as being guided by a «general management task» through time to ensure that the organization, operating in an environment described in terms of a «socioeconomic environment» and a «technological environment», accomplishes its objectives. The influence of IT on all these

forces and tasks, and on the equilibrium maintained by management, was the main subject of the research program. The first thing to note in the above framework is that it allows us to analyze the very same components as the theory proposed here, only structured in a different way. The purposefulness of the processes as described by the framework is less apparent than in the theory as depicted in Figure 1; in other words, although it is stated that the purpose is to accomplish the organization's objectives, it is not explicitly shown how this is to be done. Thus, not surprisingly, the majority of the results are consistent with the theory.

The main findings of the program are as follows: 1) «IT is enabling fundamental changes in the way work is done» (production work, as well as coordinative and management work); 2) «IT is enabling the integration of business functions at all levels within the organization and between organizations»; 3) «IT is causing shifts in the competitive climate in many industries»; 4) «IT presents new strategic opportunities for organizations that reassess their missions and operations»; 5) «Successful application of IT will require changes in management and organizational structure»; and 6) «A major challenge for management in the 1990s will be to lead their organizations through the transformation necessary to prosper in the globally competitive environment» (Scott Morton, 1991).

The first 5 findings in this list are directly relevant to the subject matter of this paper. The first thing to note is the «enabling» role attributed to IT. This is consistent with viewing IT as a resource, as in the theory put forward in this paper. Further, if IT enables changes in the way coordinative and management work is done, that means that IT can impact the organizational routines developed as the firm evolves, which again is coherent with Figure 1. Much the same can be said of the second finding, namely that the resulting capabilities and organizational routines are more integrated. The third finding cannot be «read off» directly from the theory but is a consequence of companies' having IS-enabled competitive advantages (IS-based strategic actions that lead to competitive advantage sometimes send the message to competitors in the industry that such actions are a "strategic necessity"; the case of reservation systems in the airline industry is a well-known instance of this). Finding number 4 should in a sense precede Finding number 3: it says that the influence of IT can be such as to change the firm's operations (business re-engineering) and mission. Again, this is consistent with the theory. Finding number 5 acknowledges that the interplay between IT resources, IS and IS-related capabilities, and organizational routines will require changes in the way firms are organized in order to take full advantage of the new resources, partly as a consequence of Finding number 1. The theory as presented above certainly does not contradict this: the details of Finding 5 would thus refine the theory to postulate that what it says actually happens, and how.

In addition, a couple of more specific results reported in (Scott Morton, 1991) help to demonstrate the coherence of the research program's findings with the resource-based theory. Venkatraman (Venkatraman, 1991) proposes a framework with five levels of what he calls IT-induced business reconfiguration, which he organizes in two dimensions: «Degree of business transformation» and «Range of potential benefits». From low to high, the successive levels in both dimensions are called: 1) «Localized exploitation»; 2) «Internal Integration»; 3) «Business process redesign»; 4) «Business network redesign»; and 5) «Business scope redefinition». The fact that the framework associates higher potential benefits with higher degrees of business transformation is consistent with what the resource-based theory anticipates regarding «more useful IS as the degree of specificity goes up» (see Section 4 above). In this sense, Venkatraman's «degree of business transformation» is a special case of degree of specificity.

Finally, MacDonald (MacDonald, 1991) describes the so called SAP (Strategic Alignment Process) model, aimed at making the research results of the program operative,

using «processes that exploit these results». As it turns out, SAP's components («business strategy», «IT strategy», «IS infrastructure and process», and «organizational infrastructure and process») interrelate and evolve through processes («transformation», «strategy alignment process», «embedded technology», «competition and reconfiguration», «organizational change and human resource issues», «IS implementation, tools and skills», and «global IT platform») which are perfectly coherent with the structure of Figure 1 above.

IS resources and conventional IS wisdom

The theory proposed here views basic IT as a resource, i.e. as something with the lowest degree of specificity and, as such, usable without any specific organizational effort. This implies seeing new technologies in the same way, which means understanding that *by themselves* they are not going to impact firms very much. Centering the analysis on technology alone is short-sighted; instead, what should be done is to always see new technologies from the standpoint of the capabilities they could help to create, which, according to the theory, means taking the necessary organizational routines into account (which, incidentally, tend to be a lot more firm-specific than the technologies themselves).

Just as the availability of a technology, in its resource role, can enable the development of valuable capabilities, the unavailability of a technology can constrain development. Following the same line of thought as in the preceding paragraph but in the opposite direction, it should be possible to diagnose what kind of functionality to look for in new technologies in order to be able to support the development of new capabilities (in conjunction with organizational routines). This is consistent with the practice, in some firms, of having a person with the specific responsibility of «scanning the technological horizon» for new technologies that might be useful in the context of the firm's organization and objectives.

One corollary of the above observations relates to one of today's hot topics: outsourcing. According to the theory, outsourcing resources should present no problem whatsoever. Outsourcing capababilities, however, is no longer problem-free, at least in principle. To the extent that the capability that is to be outsourced has been developed with the aid or support of firm-specific organizational routines, outsourcing it will be more complicated. Let alone core capabilities. To the best of my knowledge and experience today, this is what is going on in current outsourcing practices. See, for example, (Huber, 1993), where, in the course of explaining the outsourcing experience at Continental Bank, it is said that, «... The raw materials that make up these products are information and technology, commodities that change almost every day. And access to them is what is important. What is not important is owning the computers, employing the technical staffers, and managing the operation.» This statement is perfectly consistent with the resource-based view put forward in this paper. According to the resource-based theory, any outsourcing practice beyond that might run into difficulties. Maybe not immediately, but in the long run. Some organizations implicitly use this argument to justify their decision not to outsource not only IS operations, but any type of activity. For example, as described in (Leonard-Barton, 1992b), at Chaparral Steel «... managers have to design what they need, rather than purchase the best available equipment off-the-shelf». Why? «To keep the knowledge here», a mill manager explains.

IS capabilities and IS conventional wisdom

Capabilities can come about in many different ways with the support of IS because there are so many possibilities for the relevant organizational routines, depending upon what

firm we are talking about. The fact that they *are* capabilities, though, explains many findings in the IS field that have become classics.

For instance, seeing the «data and manipulation procedures that serve to improve the firm's activities» as capabilities implies learning –about the procedures themselves and about the organizational adjustments that are needed in order to make the procedures truly effective (see «IS capabilities» in Section 3 above). The failure to learn about the procedures leads to the typical situation where an IT expert tries simply to lay IT on top of problems without knowing enough about the problems themselves and the existing methods for solving them (this has been quite common in the areas of production programming and planning). The failure to learn about the necessary organizational adjustments, on the other hand, leads to the classic «implementation problems», for which one of the most frequently proposed solutions is to increase «user participation» in the process. This is certainly a way to bring some of the necessary organizational routines into the process, by involving the people who actually use (or possibly even developed) these routines, that is, the «depositaires» of the routines at a given point in time.

Sometimes, IS that seemed to function very well fail after some time has gone by, not because the software itself begins to malfunction, but because they continue to be used routinely without realizing that the original organizational conditions for which they were developed have changed. This shows that useful IS are not merely resources: they embed organizational routines, which, if there are changes or they become inappropriate to a new situation, may render the IS (understood as a capability) completely useless.

In the context of the above-mentioned «Managing in the 1990s» research program (Scott Morton 1991), Rockart and Short (Rockart & Short, 1991) talk about the «management of interdependence» with the aid of IT. The essence of the message is that IT makes it possible to «shrink the effects of time and space» so that new ways of organizing the interdependence among the firm's activities and among the activities of different firms become available. Again, viewed from the standpoint of our theory, IT taken as a *resource* and in combination with the appropriate organizational routines enables the development of new capabilities, or even routines, which open up new ways of managing the firm's intrinsic interdependences much more effectively than before.

Also related to this argument about managing interdependence is today's so-called «business reengineering» movement (Davenport & Short, 1990; Hammer, 1990). The whole reengineering idea can be conceptualized as the building of new capabilities with the aid of IS. Of course, our comment would be that this kind of reengineering involves a lot more than just engineering; in fact, it involves a lot of knowledge about the firm and the business, which in the theory would be represented by organizational routines that give rise to new capabilities with the aid of IS (i.e. what we called IS-related capabilities above). A good account of what is meant here is quoted in (Business Week, 1992); when talking about the retailing revolution that is taking place, a consultant states that «the power retailers have figured out a way of converting raw data into insight». It is obvious that a good IS, taking full advantage of available IT, can do a lot to collect raw data. But it has to be *the right data*, and then the *insight* has to be worked out. How? By using the appropriate organizational routines.

MacFarlan (MacFarlan, 1992) has recently emphasized how the very same systems, put to work in different organizations operating in the same industry, have yielded very different results. It is more of the same: firms have to be able to use these systems to develop capabilities that are real capabilities in the sense used throughout this paper. Some companies may have the required organizational routines and others may not; in some companies it may

even be impossible (or almost impossible) for the right routines to develop. An extreme example of this would be that of a company that bought a production programming system, embedded in a very specific software package which had been designed for batch production, whereas the company's production process was continuous! This case is certainly extreme, but it is real and serves to illustrate how sometimes capabilities just cannot develop, even when seemingly appropriate resources are available.

Core capabilities, competitive advantage and IS wisdom

Capabilities become core when environmental conditions make them valuable, rare, etc. (see above). As discussed previously, it is core capabilities that may lead to competitive advantage (that is, to SIS), and planning explicitly for them is not only possible but advisable.

Gaining strategic advantages through IS has been a common topic in the IS literature in recent years (see Business Week, 1985; Sunnot, 1987; Wiseman, 1985). Very often, SIS have been described, with emphasis being placed on their functional details or even on their technological details. The theory advocated here, however, would suggest that the basic cause of their competitive advantage lies beyond these details, in their «organizational and competitive positioning fit», which has a lot more to do with organizational routines and the competitive outlook of each firm. Also, as advanced above, this means taking IS issues explicitly into account during the business strategy design process. This has a number of implications for the firm's organizational structure and planning procedures (see, for example, Andreu, Ricart & Valor, 1992).

Another implication is more general in nature. If it is accepted that IS can contribute to a firm's core capabilities, and we recall that core capabilities provide a guiding vision of the (business) strategy (i.e. «identifying those key resources which need to be regenerated, expanded, ..., nurtured and prioritized» –Collis, 1991), it should be concluded that paying special attention to IS-related issues during strategy formulation and implementation can make a lot of sense in certain situations. Thus, considering IS as a «special strategic topic» can be appropriate. Moreover, it may be appropriate not only in cases where the strategic potential of the IS is perceived as high *per se*. Since IS are *global* in nature, devoting *company-wide* efforts to increasing the organizational and competitive positioning fit of IS is a natural thing to do and has a high potential for organizational learning.

There are also negative implications, however. IS may give rise to core rigidities as well as to core capabilities, and thus be at the root of inertia, constraints and, eventually, competitive disadvantages. In my experience, however, many of these rigidities derive, not from the organizational and competitive positioning dimensions, as do the distinctive capabilities, but from the more «mundane» functionalities and technicalities.

For example, consider the case of a bank that is unable to launch a new product in time because of delays in preparing the software needed to administer it. The problem probably lies with the existing software, which has to be (yet again!) modified and updated; or with the recently installed DBMS, which cannot cope with the structure of the new transactions. The problem is less likely to lie with the organizational or competitive positioning fit of the IS if the new product has been designed to fit in with the bank's organizational structure and competitive positioning. Accordingly, provided that the move is not made in response to the action of a competitor (as Johnson & Johnson might have done in the example discussed above), in which case it is more of a *competitive necessity* than an attempt to gain advantage, I submit that IS-based rigidities will tend to be easier to overcome

than rigidities due to organizational or positioning problems. Some comments in (Huber, 1993) seem to support this. All the same, IS-based rigidities of the other kind are not impossible.

6. Implications for managing IS, and for IS teaching and research: A proposed research agenda

The resource-based theory of IS has several implications for IS management, IS teaching, and research. This section discusses some of these implications from a very general standpoint. It concludes by proposing an agenda for research which I think should be pursued further because it seems to have reasonable potential.

Implications for IS management

The distinction between IS resources, capabilities and core capabilities provides guidelines for IS management. In particular, firms have to consider whether the responsibility for the different IS components identified by the resource-based theory should be given to separate departments and individuals or not. As always, the answer to this question depends, in part, on the responsibility structure of the firm as a whole. Nevertheless, it raises a fundamental issue, as it could be argued that the skills, training and profile needed for managing resources are significantly different from those needed for managing capabilities and core capabilities.

What is more, it is not simply a matter of skills and training; it is also a matter of responsibility structure and reporting structure; that is, of organizational structure. Are the organizational structures of IS today good enough to meet the needs implied by the resource-based theory? (7) This question has already been tackled in the past, but the resource-based perspective offers valuable insights. This would therefore be an avenue for future research.

Turning to one central task of IS management, namely IS planning, the above discussion suggests that this planning should be consistent with the business strategy design process. This is the only reasonable way to make sure that the right organizational routines are brought into play for the purpose of IS definition and development, eventually obtaining the right IS capabilities and core capabilities. Doing so may not be easy, though, precisely because capability development is involved; see, for example, (Davenport, Eccles & Prusak, 1992), where the preferred model of «information politics», as they call it, «is harder to achieve and takes more time». Since capability development is involved, the IS planning process itself can be used as a vehicle for organizational learning, although this is something that is rarely done (see Andreu, Ricart & Valor, 1992).

Also, the resource-based theory of IS provides a language which puts IS clearly in the managerial context. Talking about the development of capabilities and core capabilities with the help of IS through processes such as those shown in Figure 1 should make it easier for managers to understand the role of IS. This should make them more willing to participate effectively in the process of defining and developing the right IS. As a consequence, IS planning procedures based on the resource-based view should be investigated and checked for effectiveness in this sense.

Implications for IS teaching

Having taught IS subjects at both engineering and business schools, I am in a position such that my experience may be useful to others. From the standpoint of the resource-based theory, it is clear that IS teaching should *always* include the organizational aspects that make IS capabilities, core capabilities and organizational routines the valuable part of IS, as understood in this paper.

This implies that even at engineering schools special attention should be paid to making sure that students develop the right perception of and feeling for these organizational and competitive aspects. In my experience, this is sooner said than done. Students at these schools (particularly those in their final years) tend to hold the technological aspects in very high esteem, which often leads them to consider all other aspects as being virtually irrelevant, or as not being «valuable» or «important» enough. Maybe the organizational issues should be included very early on in the curriculum, so that, from the very beginning, students acquire an outlook in which capabilities play the central role they play in the real world of IS.

At business schools the picture is different. In my experience, the emphasis should be on making sure that students understand the role that IS can play in developing *all sorts of capabilities* that are useful for the firm's activities. Thus, in a context where capabilities, core capabilities, organizational routines, degree of specificity, and other concepts associated with the resource-based view are better understood and commonly employed (e.g., in the context of business strategy), the central argument should be *IS's relevance in the global picture*. The specific implications for curriculum design are beyond the scope of this paper, but some of them are interesting and may even lead to significant innovation.

Implications for IS research

Much of what has been said in this paper consists of more or less plausible conjectures obtained by viewing IS in the light of the resource-based view of the firm. Some of these conjectures happen to be consistent with conventional IS wisdom, while others are not so obviously consistent, as has been informally argued in preceding sections. In any case, a systematic check of these implications can, in my opinion, give unity and direction to research in the IS field, and could even widen the scope of the IS concept itself. What follows is an agenda for research drawn up with this objective in mind.

Start with detailed case studies

Research activities could start by characterizing the different IS constructs described in this paper in the context of concrete business situations in specific firms, i.e. by documenting specific examples of IS resources, capabilities, organizational routines, etc., and the corresponding degrees of specificity. Documenting specific situations in which IS-related capabilities have been mistaken for resources and exploring the consequences of this would be useful in order to gather empirical data that could be used to test some of the hypotheses advanced in this paper. Also, conducting experiments in the design and use of IS to support a firm's capability development processes would help check the validity of this idea in concrete settings. All this would contribute to the development of better conceptualizations of those resource-based constructs and their role in the firm.

After that, the implications outlined in Sections 4 and 5 above could also be tested by means of detailed case studies. For example, documenting the way such and such a system provided competitive advantage and describing its degree of specificity according to the proposed measures or scales, etc. would help develop the resource-based view of IS and show how it could be made more operative. In this context, a first set of research questions has to do with developing definitions and characterizations of IS contributions to competitive advantage using the concepts provided by the resource-based view of the firm. The theory needs to be illustrated with actual examples of information systems that:

- Make it possible to distinguish clearly between IS resources and IS capabilities
- Demonstrate path-dependence, with an emphasis on different kinds of dependence
- Enable organizational routines, and how
- Are part of organizational routines, and how
- Embed organizational routines, and how
- Display a high degree of specificity, and why (i.e. what *kind* of specificity)
- Display a high degree of organizational or competitive positioning fit, and why
- Are durable, opaque, untransferrable or unreplicable, and how
- Are valuable and how
- Are rare and how
- Serve as coordinators for bundles of resources with high potential, and how
- Provide support to the capability development process, and how
- Display characteristics opposite to all the above

This should help develop clear cut meanings for all these concepts, work out crisper definitions for them as applied to the IS field, and make it possible to identify significant relationships between them (e.g., a high degree of specificity can be achieved by the IS being part of certain organizational routines, etc.). Also, it would help confirm or overturn some of the conjectures set forth in this paper. For example, is it true that IS rigidities tend to develop more out of functionalities and technicalities than as a result of path-dependence and specificity? Is there any observable general pattern that can explain why this is so? And so on.

Then develop frameworks for diagnosing the potential of IS

Having worked out answers to the above questions, enough knowledge will be available to deduce how relevant the various concepts are in the IS field. One first way to put this knowledge to work is to develop frameworks for diagnosing the potential of existing IS and for detecting gaps.

This can be done by systematically making hypotheses about what makes IS exhibit certain relevant properties, and then testing them using data gathered from actual IS situations. The degree of specificity scale proposed in this paper could, for example, be used to characterize the most beneficial kinds of specificity, as could other constructs derived from the basic structure of the resource-based view. In this way, the research efforts could result in a sound theory of the contribution of IS to competitive advantage.

Finally, the resulting frameworks and theories should be verified by applying them to historical cases and using them to forecast the potential of existing IS, and then comparing their results with those obtained using alternative theories and frameworks.

And methodologies for developing high potential IS

Next, it will be time to develop methodologies that can guide the process of identifying, defining and developing high potential IS, probably in the context of the business strategy formulation process. These methodologies should be conceptually consistent with previous results, and should be validated as to the results they will produce when applied to actual situations.

Also, the idea of designing IS planning procedures based on the resource-based framework should be explored. These procedures should be embedded in a language that is more easily understood by practising managers in order to motivate them to participate actively and explicitly in the process. This should include developing constructs that help to specify *capability development support requirements* while specifying the corresponding IS needs.

Finally, analyze the role of IS in the business strategy formulation process

Finally, it will be necessary to explore and document the implications of all the above for the role of IS in the strategy formulation process. IS can help make a bundle of resources more valuable, or less transparent, etc. From this perspective, the role of IS in the strategy formulation process is enhanced. Thus, even when the role of IS is seen as strategically passive or complementary, they can help to make competitive advantages possible. Taking account of this possibility during the business strategy formulation process has several implications, one of them being that IS should be represented in the process, and another that the IS viewpoint should be made explicit in terms coherent with the emerging theory of resource-based strategy formulation in order to take full advantage of their potential. These implications, in turn, impose certain conditions regarding the background and training of the IS specialists who are to participate in the process.

In a wide sense, this includes analyzing what the responsibilities of these IS specialists should be in order to make the role actually happen, studying what it means in terms of organizational structure and processes, and so on. By extension, the whole issue of IS organizational structures would probably benefit from an in-depth analysis from the resource-based perspective, as suggested above. Finally, from an even more general standpoint, the effort to build on the idea of designing, developing and reinforcing competencies and core competencies in the context of a well organized system of resources, capabilities and organizational routines can provide additional insight into the resource-based framework itself.

7. Conclusion

This paper has summarized the resource-based view of the firm and some of its implications for the business strategy formulation process, and has attempted to put IS concepts and issues in that context. The goal has been to point out what the resource-based framework can contribute to the field of IS.

Some traditional IS-related topics, mainly to do with IS relationships with organizational learning, competitive fit and potential for sustainable competitive advantage, seem to fall nicely into the context of the framework, which therefore appears to be potentially useful for developing a structured theory of IS as related to organizations and their competitive strategies, not only as regards the content of those strategies but also the corresponding formulation process.

Consequently, a preliminary agenda for research has been suggested, which should be further developed and evaluated, and then used, if its potential is considered promising enough, to direct future research efforts in the above-mentioned fields. □

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(1) An alternative and conceptually equivalent view puts IS in the firm's «infrastructure» of the value chain (Porter, 1986). See for example (Andreu, Ricart & Valor, 1992).

(2) However, this shouldn't be taken to imply that IS cannot have potential for competitive advantage. As will be discussed below, they *can*, for example through the support they can provide to primary activities in the value chain, sometimes even in a fundamental manner.

(3) In fact, the following subsections might appear unnecesarily involved to the reader. A reasonable summary of these subsections could be the following: In general, any basic component of an IS (data, processes, IT) can be conceptualized as a resource. When these resources are used to develop more complex IS constructs through combinations with each other and with other resources, routines and capabilities, they give rise to new capabilities *which have one or more IS-based components.* The extent to which these IS resources and capabilities exhibit potential strategic impact will determine their potential contribution to the firm's competitive advantage.
The subsections go into a greater level of detail, however, because the exercise of classifying different IS-based constructs into the categories of resources and capabilities helps to make these concepts more concrete in the realm of IS, and thus contributes to a better layout of the proposed theory.

(4) In (Walton 1989) the concepts of «alignment», «ownership» and «competence», to be nurtured during IS conception, design and implementation, are convincingly put forward in a coherent framework, consistent with the organizational routines concept as understood in this paper.

(5) One example of this is the case of Otis Elevator (see Otisline, 1986), a subsidiary of United Technologies Corp., which, after implementing a centralized information system for customer service called Otisline, realized that the new information access patterns available had, in effect, set the basis for significant changes in both the assignment of responsibilities inside the firm and the associated control system. It can be argued that situations such as this wouldn't arise if everything had been perfectly planned. This is of course true, but since in practice such situations are not uncommon, accounting for them explicitly is advisable.

(6) In fact, the IT-Strategic Generic Action (ITSGA) concept proposed in (Andreu, Ricart & Valor, 1992) tries to help by making that process more systematic, but leaving the door open to incorporate the idiosyncrasy of the firm performing it. There are ITSGAs, for example, that suggest empowering distinctive organizational routines (not necessarily IS-related routines) by means of IS support.

(7) Prahalad and Hamel (Prahalad & Hamel, 1990) state that successful companies design the organization around their «core competences». Our perspective here also suggests that these competences should be designed, built and reinforced by a complete system based on the resources, capabilities and routines of the organization.

Appendix

A RESOURCE-BASED VIEW OF INFORMATION SYSTEMS:
A PROPOSAL FOR A RESOURCE-BASED THEORY OF IS AND AN AGENDA FOR RESEARCH

The resource-based view of the firm: An overview

Resources, Capabilities, and Competitive Advantage

Although rediscovered in recent years, the resource-based view of the firm is not a recent proposal. Today's advocates of the view often place its origins in the works of Ricardo, Schumpeter, and Penrose; for example, see (Grant, 1992). As Grant puts it,

> «When the external environment is in a state of flux, the firm's own resources and capabilities may be a much more stable basis on which to define its identity (...than the –in recent years– more popular, externally focused orientation, which does not provide such a secure foundation for formulating long-term strategy). Hence, a definition of a business in terms of what it is capable of doing may offer a more durable basis for strategy than a definition based upon the needs which the business seeks to satisfy.
>
> » ...Although the competitive strategy literature has tended to emphasize issues of strategic positioning in terms of choice between cost and differentiation advantage, and between broad and narrow market scope, *fundamental to these choices is the resource position of the firm*.»

In other words, it is the resource position of a firm that enables it to pursue a given strategic positioning (although, of course, it has to respond to environmental conditions in industries and markets in order to be effective). This appears to be the basic reason for the current interest in the resource-based framework. Although there is a risk of underestimating the importance of environmental conditions if too much emphasis is put on the *internal* resource position of a firm, a proper balance will hopefully be achieved in the future (see, for example, Amit & Schoemaker, 1993).

The resource position of a firm

What is «the resource position of a firm»? Roughly speaking, it may be defined as the inventory of assets owned by a firm, based on which it can develop distinctive capabilities, which in turn, when properly and creatively used, give rise to competitive advantages. «Properly and creatively used» here means, as we discuss below, used to take advantage of opportunities detected in the environment in order to outperform competitors, thus formulating a business strategy. As Penrose put it: «A firm may achieve rents not because it has better resources, but rather the firm's distinctive competence involves making better use of its resources» (Penrose, 1959).

From a slightly broader perspective, Wernerfelt (Wernerfelt, 1984) defines a resource as

> «anything which could be thought of as a strength or weakness of a given firm. More formally, a firm's resources at a given time could be defined as those (tangible and intangible) assets which are tied semipermanently to the firm.»

Appendix (continued)

(Amit & Schoemaker, 1993) define resources as

> «stocks of available factors that are owned or controlled by the firm. ... These resources consist, *inter alia*, of know-how that can be traded (e.g., patents and licenses), financial or physical assets (e.g., property, plant and equipment), human capital, etc.»

Several types of resources have been proposed for the purpose of classifying them. (Hofer & Schendel, 1978), for example, distinguish among Financial, Physical, Human, Organizational and Technological resources, whose names speak for themselves. (Grant, 1991) adds an additional type called Intangible, meant to explicitly consider assets such as reputation, brand recognition or goodwill.

From the resource-based perspective, the firm can be seen as seeking to acquire hard-to-imitate, valuable resources and capabilities. As (Amit & Schoemaker, 1993) put it,

> «For managers the challenge is to identify, develop, protect and deploy resources and capabilities in a way that provides the firm with a sustainable competitive advantage and, thereby, a superior return on capital.»

Thus, the resource-based view of the firm sees the differences between firms as the result of different firms' having acquired and developed heterogeneous resources and capabilities. Furthermore, heterogeneity among firms will remain as long as resources and capabilities are difficult to copy, trade, or move from one firm to another. This will then potentially lead to firm differentiation and eventually to competitive advantage, if some conditions are met (see following subsections).

Resources and capabilities

As suggested by the preceding quotes, a distinction is made between *resources* and *capabilities*. Again in Grant's words:

> «Resources are input into the production process –they are the basic units of analysis. The individual resources of the firm include items of capital equipment, skills of individual employees, patents, brand names, finance, and so on. But, on their own, few resources are productive. Productive activity requires the cooperation and coordination of teams of resources. A capability is the capacity for a team of resources to perform some task or activity. While resources are the source of a firm's capabilities, capabilities are the main source of its competitive advantage.»

Several definitions exist for the capability concept. In (Teece, Pisano & Shuen, 1990) the following definition is given:

> «A set of differentiated skills, complementary assets, and routines that provide the basis for a firm's competitive capacities and sustainable advantage in a particular business.»

Appendix (continued)

(Amit & Schoemaker, 1993) talk about capabilities *vis-a-vis* resources as follows:

> «*Capabilities*, in contrast, refer to a firm's capacity to deploy *Resources*, usually in combination, using organizational processes, to effect a desired end. They are information-based, tangible or intangible processes that are firm-specific and are developed over time through complex interactions among the firm's *Resources*. They can abstractly be thought of as 'intermediate goods' generated by the firm to provide enhanced productivity of its *Resources*, as well as strategic flexibility and protection for its final product or service. Unlike *Resources, Capabilities* are based on developing, carrying, and exchanging information through the firm's human capital.»

Apart from the explicit role assigned to information in the develoment of capabilities in this quote, which makes it specially relevant for the purposes of this paper, it points out clearly the organizational character of capabilities. Developing capabilities involves organizational learning: learning how to combine and use the involved resources, and how to do it effectively with the goal of achieving the firm's objectives. Thus, what can be termed «organizational resources» are instrumental in capability development. One way of «institutionalizing» such resources is through the «organizational routines» concept, which helps to understand the dynamics of the capability formation process in the firm.

In Grant's words (Grant, 1992), organizational routines are

> «regular and predictable patterns of activity which are made up of a sequence of coordinated actions by individuals. The behavior of the organization may be viewed as huge networks of routines ... The strategy of the corporation may be viewed as a routine: It is a set of guidelines which precondition the firm's response to events.»

One can thus think about a complete hierarchy of routines, ranging from simple ones to other very complex ones. Of special relevance are those responsible for innovation and learning, which play an important role in the capability development process. Collis (Collis, 1991) emphasizes the dynamic aspect of routines and defines «dynamic routines» as «the managerial capability to improve and upgrade firm efficiency and effectiveness: the production of new production functions...». Kogut and Zander (Kogut & Zander, 1992) use the notion of «combinative capabilities» in order to explain the transference of knowledge through the organization and the creation of new capabilities through the combination of available resources and capabilities. In a similar vein, Lado, Boyd & Wright (Lado, Boyd & Wright, 1992) talk about «transformational capabilities» as the abilities to transform resources into outputs that are valuable to the organization.

Understood in this manner, organizational routines are difficult both to imitate and to change, as they reflect the organizational learning accumulated along the whole history of a firm. Their complexity is hard to replicate due, among other reasons, to bounded rationality. This confers on capabilities and routines the potential to produce competitive advantage but also to produce inertias, as discussed below. In this paper, organizational routines will be seen as the main link between resources and capabilities.

Appendix (continued)

Another useful concept for understanding the distinction between resources and capabilities is that of «specificity» (see, for example, Montgomery & Wernerfelt, 1988). These authors talk about «factor specificity»: less specific factors are those that «lose less efficiency as they are applied farther from their origin» –i.e., they are more «general purpose». On the other hand, resources with a high degree of specificity are very efficient/effective near their origin, but their efficiency/effectiveness tends to decline quickly as they are removed from their origin –i.e., as attempts are made to use them for purposes other than those for which they were developed in the first place. Thus, capabilities will in general exhibit a higher degree of specificity than resources and will, in this sense, be more «exclusive» than resources (e.g., one is less likely to find a market for capabilities than for resources).

Finally, Leonard-Barton makes a distinction that is consistent with Wernerfelt's definition of resources (given above): resources can give rise both to capabilities (which enhance development and result in advantage) and to *rigidities* (which inhibit development and may result in disadvantage). The fact that disadvantages can also develop from resources can be explained in part through the concept of *sticky factors* put forward by Ghemawat (Ghemawat, 1991). Since it is not easy to get rid of such factors, often because the firm is committed to them, the firm can be stuck with them: if they give rise to disadvantages, the firm has a problem. This is how resources can lead to «incumbent inertia» (Lieberman & Montgomery, 1988) when faced with environmental changes. For example, technological discontinuities can enhance existing capabilities in an organization, but they can also destroy them (Tushman & Anderson, 1986). From this perspective, it can be said (Collis, 1991) that «structure does not only follow directly from strategy, but also constrains strategic choice» –see also (White & Hamermesh, 1981; Burgelman, 1983).

One reason why a factor or asset can become «sticky» is that, as (Collis, 1991) reminds us (see, for example, Dosi, Teece & Winter, 1990), there can be «acquisition- or path-dependency» of assets; that is, the way a firm owns an asset (in particular, a capability) may depend on the process through which it acquired that asset. If the acquisition process entailed far-reaching changes in culture and habits, then that asset has a high probability of becoming «sticky». Consequently, «imitability of a resource or capability is related to the characteristics of the process by which it was acquired» (Dierickx & Cool, 1989). In this sense, Collis concludes that «organizational capability can also be a source of competitive advantage in its own right». At any rate, it is important to note that capabilities are seen as having a strong organizational learning dimension: «Creating capabilities is not simply a matter of assembling a team of resources...» (Grant, 1991).

Core capabilities

Capabilities are considered *core* if they «differentiate a company strategically» (Leonard-Barton, 1992a); that is, they are specially valuable in a given context. The concept is not new; see (Leonard-Barton, 1992a) for an account of authors who use this same concept under a different name in literature references dating from the early 1970s onward. Furthermore, there seems to be evidence to show that strategies built on existing skill or resource bases in firms are associated with higher performance (Rumelt, 1974).

Appendix (continued)

On the other hand, core capabilities (sometimes also called «core competence») «typically have both an organizational/economic and a technical dimension» (Dosi, Teece & Winter, 1990), and are therefore seen as «institutionalized» (i.e., «part of the organization's taken-for-granted-reality»). In addition, «... at any given point in a corporation's history, core capabilities are evolving, and corporate survival depends upon successfully managing that evolution» (Leonard-Barton, 1992a).

The organizational dimension present in core competence is seen as the result of organizational learning, which generates knowledge that eventually resides in organizational routines (Dosi, Teece & Winter, 1990; Nelson & Winter, 1982; Grant, 1992). According to these authors, organizational routines have a strong tacit dimension, which makes them difficult to imitate; to the extent that this is so, these routines contribute to a firm's distinctive competences and capabilities.

Of specific relevance to this paper is the so-called «management systems dimension» of core capabilities (Leonard-Barton, 1992a):

> «Management systems constitute part of a core capability when they incorporate unusual blends of skills and/or foster beneficial behaviors not observed in competing firms. Incentive systems encouraging innovative activities are critical components of some core capabilities, as are unusual educational systems.»

IS being management systems, this idea is directly relevant to the main subject of this paper; see next section.

Resources can also give rise directly to core competence when they are valuable, rare and are subject to market failure; for example, having exclusive access to a gold mine.

At any rate, the fundamental character of *core* capabilities is their *potential for strategic impact*. Barney (Barney, 1991) suggests some ideas for making this concept operative. In the context of his proposal for the strategy formulation process (see below), he talks about capabilities being *valuable*, *rare*, *imperfectly imitable* and *not having strategically equivalent substitutes.* We will borrow these concepts from Barney in the IS resource-based view developed in the next section.

Core capabilities and strategy

Core capabilities (or core competence) are instrumental for strategy development. According to Collis (Collis, 1991):

> «Normatively, core competence provides a guiding vision of the strategy –identifying those key resources which need to be regenerated, expanded, and built on the firm's future activities– that is, defined internally, by reference to the firm itself and its own asset base, rather than externally by reference to competitors and relative market position. Core competence also contributes to corporate strategy by helping to define appropriate patterns of diversification, and business interrelationships (Prahalad & Hamel, 1990; see also Porter, 1987).

Appendix (continued)

» ... identifying the internal key success factors (Ohmae, 1982), in particular those intangible assets that require organizational learning, directs attention to what needs to be nurtured and prioritized inside the firm.»

A more detailed look at the role of core capabilities in the strategy formulation process is given below. Two resource-based approaches are described, namely those proposed by (Grant, 1991 & 1992) and (Barney, 1991). The two approaches are conceptually similar, although they differ in procedural details. The essence of them both is the quest for distinctive resources or capabilities, which can be seen as the fundamental goal of firms: differentiating resources and capabilities are at the root of the rent-producing processes leading to competitive advantage.

The resource-based view and the strategy formulation process

In recent years the resource-based view of the firm has been proposed as the basis for the business strategy formulation process. In (Grant, 1991) this proposal is justified in terms of resources and capabilities being both «a source of direction» and «the basis for corporate profitability». The argument is that

«a definition of a business in terms of what it is capable of doing may offer a more durable basis for strategy than a definition based upon the needs which the business seeks to satisfy.»

In summary, Grant states that

«business strategy should be viewed less as a quest for monopoly rents (the returns to market power) and more as a quest for Ricardian rents (the returns to the resources which confer competitive advantage over and above the real costs of these resources). Once these resources depreciate, become obsolescent, or are replicated by other firms, so the rents they generate tend to disappear.»

Barney (Barney, 1991) adopts a similar standpoint a bit more formally, as, stemming from his definition of sustained competitive advantage (1), he reaches the conclusion that «in order to understand sources of sustained competitive advantage, it is necessary to build a theoretical model that begins with the assumption that firm resources may be heterogeneous and immobile». He concludes that

«... the resource-based view of the firm ... simply pushes (the) value chain (Porter, 1985) logic further, by examining the attributes that resources isolated by value chain analysis must possess in order to be sources of sustained competitive advantage (Porter, 1990).»

With these visions as starting points, these two authors propose ways to apply them to strategic planning and to strategy analysis and design. They are summarized below.

Appendix (continued)

1. (Grant, 1991); (Grant, 1992)

Grant suggests that a resource-based approach to strategy comprises three key elements: i) Selecting a strategy that exploits a company's principal resources and competencies; ii) Ensuring that the firm's resources are fully employed and their profit potential is exploited to the limit; and iii) Building the company's resource base.

More formally, Grant sees the process of strategy analysis as a sequence of 5 steps: 1) Identify and classify the firm's resources, and appraise strengths and weaknesses relative to competitors; 2) Identify the firm's capabilities: what can the firm do more effectively than its rivals?; 3) Appraise the rent-engineering potential of resources and capabilities in terms of their potential for sustainable competitive advantage and the appropriability of their returns; 4) Select a strategy which best exploits the firm's resources and capababilities relative to external opportunities; and 5) Identify resource gaps which need to be filled in the future.

This process can be considered resource-based because external opportunities/threats enter it explicitly only at a later stage (Step 4 above), although it has to be understood that Steps 1 and 2 also contain implicit external ingredients, mainly in the form of the analysis of competitors.

Grant goes on to propose ways and guidelines for actually performing the above steps. For the first step, namely identifying and classifying resources, he relies on the standard classification of assets (i.e., physical, human, organizational, etc.) and then asks questions of the following type: «What opportunities exist for economizing on the use of resources?», or «What are the possibilities for using existing assets more intensely and in more profitable employment?»

At Step 2, identifying and appraising capabilities, Grant suggests using a standard functional classification of the firm's activities, although he immediately points out that often this will not suffice as «the most important capabilities are likely to be those which arise from an integration of individual functional capabilities», and calls for objectivity in appraising the firm's own capabilities compared with those of its competitors. Emphasis is placed on viewing capabilities as «organizational routines», concluding that «a key ingredient in the relationship between resources and capabilities is the ability of an organization to achieve cooperation and coordination within teams», while «there may be a trade-off between efficiency and flexibility (of routines)». The existence of «economies of experience» facilitates the development of organizational routines, and «the complexity of capabilities ... is particularly relevant to the sustainability of competitive advantage».

For Step 3, evaluating the rent-earning potential, Grant suggests a few concepts that are relevant for the purpose of identifying the capabilities with high potential for generating sustainable competitive advantage. They are: Durability, Transparency, Transferability and Replicability. Capabilities can be more durable than the resources they are based on if the firm is able to replace individual resources as they wear out or move on, thus adding to the durability dimension of the capabilities. Transparency is related to imitability by competitors –and to asset specificity. Transferability has to do with the ease of transferring the needed resources in order to build up a capability; again, asset specificity is relevant, as are geographical mobility, access to information, and the immobility of capabilities. Replicability is related to the complexity of the organizational routines involved

Appendix (continued)

–more complex routines give rise to less replicability. Having the potential to provide sustainable competitive advantage is not enough, however: such potential should be «appropriable» in order for the capabilities to be of interest. The more the capabilities belong to the organization rather than to individuals, for example, the better this condition is fullfilled.

In Step 4, strategy is formulated, trying to make the most effective use of the core resources and capabilities in the context of opportunities in the environment. This may imply that the firm limits its strategic scope to those activities where it possesses a clear competitive advantage.

Step 5, finally, calls for a diagnosis of the gaps in the firm's resources as revealed in the preceding steps. The idea is to fill these gaps in the future, either through internal development or through acquisition.

2. (Barney, 1991)

Barney's vision of the strategy formulation process sees the resource-based view and what he calls the «environmental models» as complementary:

> «[E]nvironmental models help isolate those firm attributes that exploit opportunities and/or neutralize threats, and thus specify which firm attributes can be considered as resources. The resource-based model then suggests what additional characteristics these resources must possess if they are to generate sustained competitive advantage.»

Following this vision, Barney proposes to organize the process around the idea that in order for resources to give rise to competitive advantage they must: 1) be valuable, in the sense that they exploit opportunities and/or neutralize threats in a firm's environment; 2) be rare among the firm's current and potential competitors; 3) be imperfectly imitable, and 4) not have strategically equivalent substitutes that are valuable but neither rare nor imperfectly imitable.

Thus, the process can start by identifying valuable resources, i.e., those that exploit opportunities or neutralize threats in a firm's environment (2). However, since valuable firm resources possessed by large numbers of competing or potentially competing firms cannot be sources of either competitive advantage or sustained competitive advantage, resources should in addition be «rare». How rare? According to Barney,

> «In general, as long as the number of firms that possess a particular valuable resource (or bundle of valuable resources) is less than the number of firms needed to generate perfect competition dynamics in an industry (Hirshleifer, 1980), that resource has the potential of generating a competitive advantage.»

In order for competitive advantages to be sustainable, the resources they are based on should also be imperfectly imitable. Barney sees three reasons why this can come about: a) through unique historical conditions of the resource acquisition process, i.e. path-dependency; b) the link between the resources and sustainable advantage being causally ambiguous (see Lippman & Rumelt, 1982); and c) the resources being socially complex.

Appendix (continued)

Finally, the resources that generate sustainable competitive advantage should not have strategically equivalent substitutes. Substitutes, in this sense, can come from similar resources in other firms that enable those firms to conceive and implement the same strategies; alternatively, they can come from different types of resources which can be employed to attain the same results. Both render the former incapable of generating sustainable advantages.

Following this sequence of conditions on resources and capabilities, the strategy formulation process can be seen as one that keeps narrowing down the bundle of resources on which strategy is going to be based, making sure that they are the ones that will lead to sustainable competitive advantage. In this sense, it is a resource-based process, as it keeps focusing on resources all the time, while introducing the relevant ingredients from the environment as the process progresses.

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(1) The definition is as follows: «a firm is said to have a sustained competitive advantage when it is implementing a value creating strategy not simultaneously being implemented by any current or potential competitors and when these other firms are unable to duplicate the benefits of this strategy».

(2) Note that as compared to Grant's approach, Barney proposes that environmental considerations come explicitly into play much earlier in the process. The difference is that Barney proposes first to focus the resources given the environment characteristics and then keep refining them with the goal of developing sustainable competitive advantage potential, while Grant does almost the opposite.

References

(Amit & Schoemaker, 1993): Amit, R., and Schoemaker, P.J.H.: «Strategic Assets and Organizational Rent», *Strategic Management Journal*, Vol. 14, 1993.

(Andreu, Ricart & Valor, 1991): Andreu, R., Ricart, J.E., & Valor, J.: «The Strategic Dimension of Transactional Information Systems: Some Organizational Implications», *Journal of Information Systems*, 1991.

(Andreu, Ricart & Valor, 1992): Andreu, R., Ricart, J.E., & Valor, J.: *Information Systems Strategic Planning: A Source of Competitive Advantage*, NCC Blackwell, 1992.

(Balakrishnan & Fox, 1993): Balakrishnan, S. and Fox, I.: «Asset Specificity, Firm Heterogeneity and Capital Structure», *Strategic Management Journal*, Vol. 14, 1993.

(Barney, 1991): Barney, J.: «Firm Resources and Sustained Competitive Advantage», *Journal of Management*, Vol. 17 No. 1, 1991.

(Burgelman, 1983): Burgelman, R.: «A Model of the Interaction of Strategic Behavior Corporate Context and the Concept of Strategy», *Academy of Management Review*, 8 (1), 1983.

(Business Week, 1985): «Information Power», Cover story, Business Week, October 1985.

(Business Week, 1992): «Clout!: More and More, Retail Giants Rule the Marketplace», Business Week, December 21, 1992.

(Cash & Gogan, 1987): Cash, J. & Gogan, J.: «Incrementalism versus Rationalism in the Effective Exploitation of Information Technologies», *manuscript presented at the 7th Annual International Conference of the Strategic Management Society*, Boston, MA, October 1987.

(Ciborra, 1991): Ciborra, C.: «The Limits of Strategic Information Systems», *International Journal of Information Resource Management*, Vol. 2, No. 3, 1991.

(Collis, 1991): Collis, D.: «A Resource-Based Analysis of Global Competition: The Case of the Bearings Industry», *Strategic Management Journal*, Vol. 12, 1991.

(Davenport, Eccles & Prusak, 1992): Davenport, T.H., Eccles, R.G., and Prusak, L.: «Information Politics», *Sloan Management Review*, Fall 1992.

(Davenport & Short, 1990): Davenport, T.H. and Short, J.E.: «The New Industrial Engineering: Information Technology and Business Process Redesign», *Sloan Management Review*, Summer 1990.

(Dierickx & Cool, 1989): Dierickx, I & Cool, K.: «Asset Stock Accumulation and Sustainability of Competitive Advantage», *Management Science*, Vol. 35 No. 12, December 1989.

(Dosi, Teece & Winter, 1990): Dosi, G., Teece, D.J. & Winter, S.: «Toward a Theory of Corporate Coherence: Preliminary Remarks», Mimeo, March 1990.

(Ghemawat, 1991): Ghemawat, P.: *Commitment: The Dynamic of Strategy*, New York: The Free Press, 1991.

(Grant, 1991): Grant, R.M.: «The Resource-Based Theory of Competitive Advantage: Implications for Strategy Formulation», *California Management Review*, Spring 1991.

(Grant, 1992): Grant, R.M.: *Contemporary Strategy Analysis: Concepts, Techniques, Applications*, Cambridge, Mass.: Basil Blackwell, 1992.

(Hammer, 1990): Hammer, M.: «Reengineering Work: Don't Automate, Obliterate», *Harvard Business Review*, July-September 1990.

(Henderson & Venkatraman, 1991): Henderson, J.C. & Venkatraman, N.: «Strategic Alignment: A Model for Organizational Transformation Through Information Technology», in *Transforming Organizations*, edited by T. A. Kochan and M. Useem, 1991.

(Hirshleifer, 1980): Hirshleifer, J.: *Price theory and applications* (2nd. edition), Englewood Cliffs, NJ: Prentice-Hall, 1980

(Hofer & Schendel, 1978): Hofer, C. & Schendel, D.: *Strategy Formulation: Analytic Concepts*, St. Paul, MN: West, 1978.

(Huber, 1993): Huber, R.L.: «How Continental Bank Outsourced Its "Crown Jewels"», *Harvard Business Review*, January - February, 1993.

(Kogut & Zander, 1992): Kogut, B. and Zander, U.: «Knowledge in the Firm, Combinative Capabilities, and the Replication of Technology», *Organization Science*, Vol. 3, August 1992.

(Lado, Boyd & Wright, 1992): Lado, A., Boyd, N.G. and Wright, P. : «A Competency-Based Model of Sustainable Competitive Advantage: Towards a Conceptual Integration», *Journal of Management*, Vol. 18 Nº 1, 1992.

(Leonard-Barton, 1992a): Leonard-Barton, D.: «Core Capabilities and Core Rigidities: A Paradox in Managing New Product Development», *Strategic Management Journal*, Vol. 13, 1992.

(Leonard-Barton, 1992b): Leonard-Barton, D.: «The Factory as a Learning Laboratory», *Sloan Management Review*, Fall 1992.

(Lieberman & Montgomery, 1988): Lieberman, M. & Montgomery, D.: «First Mover Advantages», *Strategic Management Journal*, Vol. 9, 1988.

(Lippman & Rumelt, 1982): Lippman, S. and Rumelt, R.: «Uncertain Imitability: An Analysis of Interfirm Difference in Efficiency under Competition», *Bell Journal of Economics*, 1982.

(MacDonald, 1991): MacDonald, K.H.: «Business Strategy Development, Alignment, and Redesign», in (Scott Morton, 1991).

(MacFarlan, 1984): MacFarlan, W.F.: «Information Technology Changes the Way You Compete», *Harvard Business Review*, May - June 1984.

(MacFarlan, 1992): MacFarlan, W.F.: Keynote speech at ICIS' 92, Dallas, Texas, December 1992.

(Montgomery & Wernerfelt, 1988): Montgomery, C.A. & Wernerfelt, B.: «Diversification, Ricardian Rents, and Tobin's q», *RAND Journal of Economics*, Vol. 19 No. 4, Winter 1988.

(Nelson & Winter, 1982): Nelson, R.R. & Winter, S.G.: *An Evolutionary Theory of Economic Change*, Belknap, Cambridge, Mass., 1982.

(Ohmae, 1982): Ohmae, K.: *The Mind of the Strategist*, New York, McGraw-Hill, 1982.

(Otisline, 1986): «Otisline», HBS case 9-186-304, 1986.

(Penrose, 1959): Penrose, E.: *The Theory of the Growth of the Firm*, London: Basil Blackwell, 1959

(Porter, 1985): Porter, M.: *Competitive Advantage*, New York: Free Press, 1985.

(Porter, 1987): Porter, M.: «From competitive advantage to corporate strategy», *Harvard Business Review*, May-June 1987.

(Porter, 1990): Porter, M.: «Why firms are successful», Paper presented at the Fundamental Issues in Strategy Conference, Napa, CA, 1990.

(Prahalad & Hamel, 1990): Prahalad, C.K. & Hamel, G.: «The Core Competence of the Corporation», *Harvard Business Review*, Vol. 68 No. 3, 1990.

(Rockart & De Long, 1988): Rockart, J.F. and De Long, D.W.: *Executive Support Systems*, Dow-Jones Irwin, 1988.

(Rockart & Short, 1991): Rockart, J.F. & Short, J.E.: «The Networked Organization and the Management of Interdependence», in (Scott Morton, 1991).

(Scott Morton, 1991): Scott Morton, M. S., editor: *The Corporation of the 1990s: Information Technology and Organizational Transformation*, Oxford University Press, 1991.

(Short & Venkatraman, 1992): Short, J.E., and Venkatraman, N.: «Beyond Business Process Redesign: Redefining Baxter's Business Network», *Sloan Management Review*, Fall 1992.

(Smith, 1991): Smith, F.: «The Distribution Revolution: Time Flies at Federal Express», in *Time-Based Competition*, J. Blackburn, Editor, Business One Irwin, 1991.

(Sunnot, 1987): Sunnot, W.: *The Information Weapon: Winning Customers and Markets with Technology*, John Wiley, 1987.

(Teece, 1986): Teece, D.: «Profiting from Technological Innovation», *Research Policy*, 15, 1986.

(Teece, Pisano & Shuen, 1990): Teece, D., Pisano, G. & Shuen, A.: «Firm Capabilities, Resources and the Concept of Corporate Strategy», *Consortium on Competitiveness and Cooperation W.P. # 90 - 9*, U. of California at Berkeley, Center for Research in Management, Berkeley, CA, 1990.

(Tushman & Anderson, 1986): Tushman, M. & Anderson, P.: «Technological Discontinuities and Organizational Environments», *Administrative Science Quarterly*, Vol. 31, 1986.

(Venkatraman, 1991): Venkatraman, N.: «IT-Induced Business Reconfiguration», in (Scott Morton, 1991).

(Vitale, Ives & Beath): Vitale, M., Ives, B. & Beath, C.: «Linking Information Technology and Corporate Strategy: An Organizational View», *Information Technology and Management Strategy*, Prentice-Hall, Englewood Cliffs.

(Walton, 1989): Walton, R.: *Up and Running: Integrating Information Technology and the Organization*, Boston, MA: The Harvard Business School Press, 1989.

(Wernerfelt, 1984): Wernerfelt, B.: «A resource-Based View of the Firm», *Strategic Management Journal*, 1984.

(White & Hamermesh, 1981): White, R. & Hamermesh, R.: «Toward a Model of Business Unit Performance», *Academy of Management Review*, 6 (2), 1981.

(Wiseman, 1985): Wiseman, C.: *Strategy and Computers: Information Systems as Competitive Weapons*, Dow Jones-Irwin, 1985.

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