Sustaining IT-Dependent Competitive Advantage: The Static Model

Since the early 1980s, proponents of the strategic value of harnessing Information Technology (IT) to the creation of competitive advantage have presented frameworks for identifying opportunities and have developed measures for evaluating the extent to which IT can lead to competitive advantage.\(^1\) The widely accepted conclusion is that IT can create competitive advantage through efficiency improvements and other forms of cost reductions, through the development of new distribution channels, or by enabling the differentiation of the firm’s product and service.

The question of the sustainability of IT-dependent competitive advantage has attracted considerably less attention, and much of that attention has led to pessimistic conclusions. The assumption usually underlying this pessimistic view is that “IT” per se cannot lead to sustainable competitive advantage because competitors can easily acquire “IT” and quickly replicate virtually any of its applications.\(^2\) We suggest instead that a narrow focus on IT in the quest for sustainable competitive advantage risks oversimplifying the complexities and the potential strategic contributions of advanced information technologies. Information technologies are neither homogeneous nor undifferentiated. Rather, technologies differ with respect to their characteristics, and the context in which they are introduced and used. For example, information technologies differ dramatically with respect to their complexity and the degree of organizational change that needs to occur during the implementation process. While a web site can easily be designed and deployed, large infrastructure projects (e.g., data warehouses, ERP implementations) are complex, lengthy, and prone to failure.

In theory, technology might be easily copied, but it does not follow that strategies based on the use of IT cannot lead to sustainable competitive advantage.\(^3\) In this note we formulate a framework that identifies the determinants of sustainability and helps to explain the process by which they operate for particular IT-dependent strategic initiatives. Here we conceptualize the process by which IT-dependent strategic initiatives produce sustainable competitive advantage as a static process by which firms analyze their current portfolio of response lag drivers and use this information to formulate and deploy initiatives that maximize barriers to imitation. This analysis is necessary when evaluating a proposed IT-dependent strategic initiative or when examining a competitor’s move. Note however that, as with any other competitive move, IT-dependent strategic initiatives are subject to the decay of barriers to imitation and the erosion

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\(^1\) See for example the work of Bharadwaj 2000; Clemons and Row 1991; Ives and Learmonth 1984; Porter and Millar 1985; Sethi and King 1994; Stratopoulos and Dehning 2000.

\(^2\) See for example Mata et al. 1995; Powell and Dent-Micalef 1997; Ross et al. 1996.

\(^3\) Similarly, research examining sustainability of product innovations has repeatedly shown that products that a cursory evaluation would consider easily replicable by competitors often lead to sustained competitive advantage and large volumes of business (Macmillan et al. 1985; Makadok 1998)

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of competitive advantage over time. Understanding the renewal of barriers to imitation over time is an important follow-up analysis and the topic of a separate note.

**IT-dependent strategies initiatives** are strategic moves that rely heavily on IT (i.e., they cannot feasibly be enacted without investments in IT) and are intended to create added value. Typical examples of such initiatives include business process reengineering, customer relationship management, organizational learning, knowledge management, electronic commerce, electronic business and infrastructure initiatives, as well as a host of other initiatives with no specific name (e.g., the introduction of Internet Cafés on cruise ships or the development of online banking applications). Thus, IT-dependent strategic initiatives do not simply entail building a system that provides superior returns until it is successfully replicated. Rather, they consist of the configuration of an activity system, enabled by IT, designed to create and appropriate value.

The framework presented here can be effectively used as a diagnostic tool *a posteriori*, to understand how certain IT-dependent strategic initiatives led to sustainable competitive advantage, or as a planning tool, to analyze a new proposed IT-dependent strategic initiative.

**Sustainable Competitive Advantage**

The concept of competitive advantage is rooted in the logic of value creation and distribution. A firm achieves competitive advantage when the value it creates in an economic exchange is greater than the value that could be created if the firm did not participate. In other words, the firm contributes something unique and valuable to its value system (defined as the set of suppliers, distributors, and customer with which the firm does business).

We speak of sustainability when the “firm’s competitive advantage resists erosion by competitor behavior… [this] requires that a firm possesses some barriers that make imitation of the strategy difficult.”

The ability to sustain a position of competitive advantage therefore requires the creation of impediments, or barriers, to imitation, which inhibit competitors from replicating the strategy. The height of these barriers determines the time and cost required for a competitive response and, therefore, the resistance of the advantage to erosion. IT investments, if carefully orchestrated, can help sustain competitive advantage by enabling strategic initiatives that erect and maintain high barriers to imitation over time.

Competitive imitation is often thought to occur in stages. Once they find themselves disadvantaged, rivals search for the source of the problem. This may involve considerable ambiguity, making it difficult for the imitator to mount a response. As competitors identify the sources of the firm’s competitive advantage, they must first decide whether they are able and willing to respond, and if they are, what approach to take. Typically competitors first seek to imitate the leader by attempting to modify their existing strategies and then by directly attacking the source of the leader’s competitive advantage. *Response lag*, “the time it takes competitors to respond aggressively enough to erode the competitive advantage” represents the delay in competitive response.

The height of barriers to imitation is directly related to their ability to generate response lag and forestall imitation. *Response lag drivers* are the factors that determine the magnitude of barriers to imitation. Among these are characteristics of the technology, the firm, its competitors, or the value system in which the firm is embedded. In the remainder of this note we discuss barriers to imitation and response lag drivers associated with IT-dependent strategic initiatives.

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4 (Porter 1985 p.20)  
5 (MacMillan 1989 p. 24)
IT-dependent Strategic Initiatives and the Potential for Sustainable Competitive Advantage

Through careful analysis and management of the characteristics of the development project, the firm’s unique resources, and/or the characteristics of the value system in which the organization is embedded, managers can develop IT-dependent strategic initiatives that substantially increase response lag to imitation. Four barriers to imitation (Figure 1) capture the determinants of sustainability: IT project barrier, IT resources and capabilities barrier, complementary resources barrier, and preemption barrier. These four barriers contribute independently to the sustainability of competitive advantage by creating response lag and making it difficult, costly, or impossible for competitors to replicate the IT-dependent strategic initiative pioneered by the firm.

Figure 1: Sustainable Competitive Advantage and Barriers to Imitation
IT Project Barrier

The development and implementation of the IT project provides the first opportunity to raise barriers to imitation. The IT Project Barrier rises proportionally with the difficulty likely to be encountered by a competitor in designing, developing, and introducing the IT necessary to copy the strategic initiative. Since IT-dependent strategic initiatives rely on an essential enabling IT core, they cannot be implemented until the necessary technology has been successfully introduced. The response lag drivers of the IT project barrier are driven by the characteristics of the technology and the implementation process.

![Figure 2: IT Project Barrier](image)

IT Characteristics

Information technologies differ with respect to their complexity, uniqueness, and visibility to competitors.

**IT complexity**

Different IT have different degrees of complexity (e.g., data warehouse vs. web sites). The complexity of the technology is a function of the bundle of skills and knowledge necessary to effectively design, develop, implement, and use the IT in question. While the same technology may present different challenges to different organizations, because of their varying degrees of knowledge with any given technology, different technologies have inherently different levels of complexity. This applies to both process technologies (e.g., CASE tools, programming languages) used to design and develop systems, as well as packaged applications (e.g., SAP R/3, Oracle 8). Technology complexity raises the IT project barrier by increasing development lead times for a competitive response.

**IT uniqueness**

On one side of the IT uniqueness continuum are self-contained, off-the-shelf IT products that need little integration or customization (e.g., a new electronic mail system). At the opposite end are custom developed applications or infrastructure subsystems that are unavailable in the open market. An example of the significant benefits to be achieved by customized integration comes from Amazon, the on-line bookseller. Amazon has made
significant investments in technology in its warehouses, involving large package sorting devices fed by warehouse personnel equipped with handheld devices loaded with customized software. By fine-tuning the software and processes, Amazon claims to have been able, with one-third less staff, to process 30% more packages on peak days in December of 2001 than they had on peak December days in 2000. The head of Amazon operations anticipates that with further fine-tuning they could eventually double their throughput of orders. Much of the benefits at Amazon came from tailoring the handheld devices carried by warehouse personnel, as the new software beams far more explicit instructions to workers about where they should go and what they should do.

IT uniqueness reinforces the IT project barrier because, in order to develop and introduce highly unique IT, the innovator must acquire the necessary know-how and technical knowledge, expertise that will then serve as a barrier to replication. Conversely, when the IT underlying the innovator’s strategy is not unique, consultants and outsourcing or service firms can be engaged by competitors to aid them in reducing knowledge barriers and, thereby, reduce the imitation response lag.

**Visibility**

Visibility is the extent to which the enabling technology is observable to competitors. The visibility dimension can be conceptualized as a continuum spanning from custom developed internal systems (e.g., data warehouse) to inter-organizational or customer facing systems that require extensive education and selling to external users or customers (e.g., an online purchasing system). IT that is highly visible is, by definition, readily available for inspection by competitors. As a consequence, the technology, its characteristics, benefits, and drawbacks can be easily examined by competitors who can reduce time and effort entailed by an imitation strategy.

**Implementation Process**

Different information technologies are inherently dissimilar, as discussed above, and the processes by which they are implemented and become available to the organization differ as well. Depending on the implementation characteristics of the IT core of the strategic initiative in question, the strength of the barriers to imitation changes quite significantly.

**Implementation process complexity**

Implementation process complexity is a function of the size and scope of the project, the number of functional units involved, the complexity of user requirements, possible political issues, and the likes. IT infrastructure projects represent a powerful example of complex systems that have substantial lead times, estimated to generally exceed five years. While the components may be commodity-like (e.g., personal computers, server, telecommunication equipment) it is extremely difficult to integrate them into an effective system. For instance, HEB – the Texas-based grocery chain - installed Point-of-Sale scanning systems in the 1980s and soon saw their potential as an infrastructure for automatic stock replenishment applications. But it was not until 1997 that the firm was able to achieve high enough scan rates to rely significantly on the data for reordering. Problems were largely not associated with the devices, but with the implementation of appropriate business processes by HEB and its suppliers.

**Degree of process change**

As both the Amazon and HEB examples illustrate, processes often need to change to fit a new system - particularly for large, off-the-shelf systems like ERPs. For IT-dependent strategic initiatives that rely on inter-organizational IT spanning the boundaries of multiple firms the challenges are further magnified. The more departments involved, and the more organizational boundaries crossed, the harder and the riskier the change becomes. Yet, as complexity increases, so do the difficulties encountered by competitors in imitating the strategy.
IT Resources and Capabilities Barrier

IT-dependent strategic initiatives rely on IT to support a complex network of activities designed to create added value. These strategic initiatives are dependent on access to the resources and capabilities necessary to produce and utilize the technology. As the strategy becomes more reliant on pre-existing IT resources (such as the IT infrastructure and data sources or repositories) and capabilities (such as IT development and management skills), it becomes increasingly difficult to copy. Two classes of response lag drivers contribute to the height of the IT resources barrier; these are IT resources and IT capabilities.

![Figure 3: IT Resources and Capability Barrier](image)

**IT Resources**

IT resources are technology assets available to the organization, including hardware components and platforms (e.g., a private network connecting globally distributed locations), software applications and environments (e.g., a proprietary revenue management system using custom developed models), and data repositories. These resources contribute to building response lag directly, by simplifying and speeding up the development and introduction of the initiative’s IT core, or indirectly, by making it difficult for competitors who have no ready access to the needed IT resources to replicate leader’s initiative.

**IT infrastructure**

An IT infrastructure is a set of IT components that are interconnected and managed by IT specialists with the objective of providing a set of standard services to the organization. Thus, the IT infrastructure provides the foundation for the delivery of business applications. The reach of the infrastructure refers to the extent of the connectivity within and outside of the firm. Its range is the scope of services provided. As reach and range increase, the resources made available by the IT infrastructure and its ability to support a wide array of strategic initiatives increase as well.
When underpinning the implementation of an IT-dependent strategic initiative, an IT infrastructure can contribute to the development of considerable response lag. An appropriate IT infrastructure enables strategic initiatives. As competitors move to replicate a successful strategic initiative, they not only must introduce the IT at its core, but they must now replicate the infrastructure services that support the IT core. With IT infrastructure development times estimated to generally exceed five years, the response lag and ensuing barrier to imitation is likely to be very substantial. For example, firms with an extensive IT infrastructure face fewer technological obstacles to the implementation of business process redesign initiatives. On the other hand, a competitor’s infrastructure, even if otherwise sophisticated, can serve as a barrier if it does not support a response to a particular strategic threat. Investments in enterprise resource planning software, for instance, may lock a firm into a limited set of business responses. Thus, evaluating the infrastructure requirements needed by a planned IT-dependent strategic initiative can point to substantial lag drivers to be exploited.

Information repositories

Information is now widely recognized as a fundamental organizational resource and firms are investing significantly to improve their ability to collect, store, manage, and distribute it. Information repositories are often large data stores containing extensive information about customers, suppliers, products, or operations, organized in a structured form that is accessible and usable for decision-making purposes. But far more focused repositories can also play a strategic role.

When information is tightly linked to the firm’s unique offerings, its value is dissipated or greatly diminished unless the information is used with the firm’s product or service. For example, Amazon.com received substantial press for its ability to offer personal recommendations to its customers based on their buying patterns and those of “similar” customers (using a technology known as collaborative filtering). A competitor that wishes to offer the same degree of personalization is not only required to acquire and deploy collaborative filtering technology, but also must accumulate a critical mass of buying behavior information. As the example shows, a firm’s information repositories can contribute to the development of substantial response lag by supporting strategic initiatives that use this idiosyncratic information. Competitors attempting to replicate the leader’s strategic initiative must not only duplicate the IT at its core, but they must also accumulate a comparable information resource - a feat that, by definition, often takes substantial time (i.e., Amazon’s competitors cannot “speed-up” sales).

IT Capabilities

IT capabilities are derived from the skills and abilities of the firm’s workforce. IT capabilities include technical skills and business understanding, IT management skills, IT usage skills, and relationship assets. These capabilities directly influence the response lag associated with the introduction of IT at the core of IT-dependent strategies because they facilitate the technology’s design and development. They also play a fundamental role in enabling effective and timely implementation, maintenance, and utilization of the technology.
IT technical skills and business understanding

IT technical skills relate to the ability to design and develop effective computer applications. They include proficiency in system analysis and design, infrastructure design, programming, and so on. Another element is the depth of business understanding of IT specialists. Business understanding enables the IT specialists charged with developing the technology supporting IT-dependent strategic initiatives to envision a creative and feasible technical solution to business problems. A high level of business understanding also contributes to the creation of response lag by mitigating the risks associated with the introduction of the strategic initiative and the relative investments in technology.

IT management skills

IT management skills refer to the ability to provide leadership for the IS function, manage IT projects, integrate different technical skills, evaluate technology options, select appropriate technology sourcing alternatives, and manage change ensuing from the introduction of IT. IT management skills, because of their idiosyncratic nature, the learning curve associated with their development, and their socially complex and tacit nature, are a viable source of sustainable competitive advantage. Managerial IT skills can contribute to creating substantial response lag when techniques and routines developed over time can significantly reduce development costs and development lead times. These skills are likely to be generally applicable across a number of projects and technologies. Thus, when a new IT-dependent strategic initiative is introduced, managerial IT skills can be leveraged to deliver the necessary IT core in a timely and effective manner. Competitors, who attempt to replicate the initiative but lack the same high level of managerial IT skills as the innovator, face substantial obstacles to imitation.

Relationship asset

The relationship asset is accumulated over time and finds its roots in a mutual respect and trusting rapport between the IS function and business clients. When a firm has developed a significant relationship asset, IS specialists and business clients are able to work together more effectively by coordinating and communicating extensively; they share a vision for the role of IT within the business, business clients share the risk and accept the responsibility for IT projects, and IS specialists are able to anticipate business IT needs and devise solutions that support these needs.

The relationship asset’s main contribution to response lag occurs in the early stages of design and development of IT-dependent strategic initiatives. As the business needs, or the opportunity, for the introduction of a strategic initiative is delineating, firms with strong relationship assets can involve the IS function and work together to jointly optimize the initiative and the IT core. The relationship asset has been identified as a driving force behind such success stories as American Airlines SABRE and Wal-Mart purchasing and inventory initiatives.

Complementary Resources Barrier

While IT are fundamental components of any IT-dependent strategic initiative, successful implementation of these initiatives requires that complementary organizational resources be mobilized as well. Thus, in order to implement an IT-dependent strategic initiative, the firm must develop or acquire the necessary complementary resources. As an initiative becomes more reliant on distinctive complementary resources, the complementary resource barrier to imitation strengthens, and replication of the strategy becomes slower, costlier, and more difficult. That is, competitors will have to acquire or develop not only the IT at the core of the strategy, but also the complementary resources that underpin the initiative. Response lag drivers contributing to the height of the complementary resources barrier are discussed here.
Structural Resources

Structural resources are comprised of non-IT related tangible and intangible internal assets used by the firm in the enactment of its IT-dependent strategic initiative.

Tangible resources

In theory, any tangible resource available to the firm can underpin an IT-dependent strategic initiative. Among these are competitive scope, physical assets, scale of operations and market share, organizational structure, governance, and slack resources. A classic example is Dell Corporation. Because the firm sold direct rather than through retail channels, it was much better positioned than its competitors (e.g., Compaq) to leverage the emergence of the commercial World Wide Web.

Intangible resources

A similar case can be made for intangible resources. Examples of commonly cited intangible resources that can be leveraged to an IT-dependent strategic initiative include: corporate culture, top management commitment, and the ability to manage risk. As with tangible IT resources, complementary intangible resources create response lag by making the strategy difficult to imitate. Note that these resources can also prove to be a source of rigidity. For instance, Levi Strauss's long standing relationship with large retail chains, and perhaps fear of reprisal, has made it impossible for them to sell direct via the Internet. Thus, they can only attempt to replicate others' initiatives by working with their retail partners.

Action Resources

A firm's action resources define how the firm carries out its productive activities. The action resources specify what activities are performed and what steps, or business processes, make up these activities. An IT-dependent strategic initiative relies on a collection of distinct activities, orchestrated to create added value, that are performed according to explicit or implicit business processes. For example, a Customer Relationship Management (CRM) initiative calls for a concerted set of activities spanning marketing, procurement, staffing, operations, and service that are enabled by IT. The activities that the firm performs, and the manner in which it performs them, can be leveraged to create response lag and sustain competitive advantage.
Activity system

A performance maximizing activity system relies on a set of economic activities that are both interlocking and mutually reinforcing, expressly showing internal consistency (internal fit) and that are appropriately configured given the firm’s external environment (external fit). While being one of the fundamental components of the strategy, IT must fit within the entire activity system.

The process by which an established activity system contributes to generating response lag and raising barriers to imitation is rooted in the interaction among activities. That is, when a firm has implemented a given configuration of activities and has developed the IT core supporting and mutually reinforcing the linked activities, replication of the technology alone is insufficient for successful imitation. Narrowly replicating one element of the activity systems (e.g., the IT core) leads to further decline of the imitator’s current position by wasting time, money, and management attention, rather than successful erosion of the leader’s competitive advantage. In addition to the introduction of a comparable IT core, imitation of the IT-dependent strategic initiative calls for reconfiguration of the linked activities. This approach rapidly becomes unmanageable as the number of activities to be replicated increases. A classic example of a firm that has an idiosyncratic activity system is Southwest Airlines. Because Southwest does not cater flights, does not offer seating assignments, has a standardized fleet of aircrafts, uses less crowded airports and focuses on point-to-point travel by price sensitive customers, it is much more resilient to competitive imitation. When IT is introduced with careful attention as to how it complements and reinforces the firm’s existing and unique activity system, considerable - and often insurmountable - response lag is generated and the strategic initiative is insulated from competitive imitation.

Business processes

A business process is defined as the “specific ordering of work activities across time and place, with a beginning, and end, and clearly identified inputs and outputs: a structure for action.” Thus, a business process is mainly concerned with the manner in which work is performed, rather than with what work is performed. The notion of business process is related to, but distinct from, that of economic activities introduced above. Economic activities describe what set of undertakings the firm performs, while business processes describe how the firm performs them. Thus, two firms could perform the same economic activity (e.g., operating the customer service call center) in widely different ways (e.g., “respond to calls within 40 seconds and, on average, complete calls in less than 2 minutes,” as opposed to: “segment inbound calls based on caller identification information, direct customers to agents assigned to the caller’s lifetime value segment, and handle the call accordingly”).

The contribution business processes make to response lag and to the height of barriers to imitation depends on their uniqueness and strategic value. For instance, a spare parts manufacturer has chosen not to implement an industry standard enterprise system because its uniquely flexible customer fulfillment process is a source of positive differentiation in the marketplace. When a firm is able to introduce an IT-dependent strategic initiative built around a business process with characteristics of uniqueness and differentiation, significant barriers to imitation are erected. Competitors pursuing a similar strategy will not only need to introduce similar IT, but also redesign its processes to leverage the technology, a feat of considerable complexity and risk.

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6 See Siggelkow 2001 for more information about the role of activity systems.
7 (Davenport 1993 p. 5)
**External Resources**

As a firm performs the economic activities that form the fabric of its strategic initiatives and interacts with other organizations that belong to its value system, it accumulates external resources. External resources are assets that do not reside internally with the firm, like geographic location or the organizational culture, but accumulate with other firms and with consumers. External resources are generally intangible and developed over time.

When a firm’s IT-dependent strategic initiative can leverage or contribute to the building of these external resources, it considerably improves response lag and barriers to imitation. Thus, the firm forces competitors to develop a comparable level of these resources before producing an effective response. Examples of commonly leveraged external resources are brand, reputation, and inter-organizational relationship assets.

**Preemption Barrier**

A final barrier to imitation that can contribute to delaying or preventing the decay of IT-dependent competitive advantage is the preemption barrier. Many of the classic examples of IT-dependent strategic initiatives represent innovative systems that provided the leading firm with early mover advantages and the ability to preempt retaliation from imitators. Initiatives such as Merrill Lynch’s Cash Management Account, American Airlines’ SABRE, American Hospital Supply Corporation’s ASAP, and Pacific Pride System’s Cardlock seem to owe much of their success to their ability to leverage and defend their pioneering efforts. The IT-dependent strategic initiatives introduced by these pioneers led to preferential relationships with customers or other members of the value system and produced significant barriers to imitation, thereby helping to protect the leaders’ competitive advantage.\(^8\)

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\(^8\) The preemption barrier to imitation emerges in the context of relationships between the firm and other organizations engaged in a business relationship with it. While these business relationships may occur with any entity in the firm’s value system, for simplicity we refer to them henceforth as “the customer.”
Switching Costs

“Switching costs are the norm, not the exception, in the information economy.”\(^9\) IT-dependent strategic initiatives, heavily relying on the collection, storage, manipulation, and distribution of information, are particularly suited to the creation and exploitation of switching costs. We define switching costs as the total costs - including psychological, physical, and economic costs - borne by the parties of an exchange when one of them leaves the exchange. Switching costs stem from investments that are specific to the IT-dependent strategic initiative, where the term “specific” indicates that the value of these complementary investments is significantly lower in any alternative use. A classic example of switching costs is the total cost that computer users face when they decide to switch to a different platform (e.g., from the PC to the Mac). The decision entails costs corresponding to the current value of past investments in platform specific training, software, peripherals, data conversion costs, non-transferable data, and the likes.

While savvy customers recognize the existence of switching costs, and the peril of being “locked-in,” they often willingly agree to make the needed investments (i.e., absorb switching costs) when they perceive the firm's offerings to be of value. For instance, a customer of Land's End custom tailoring program is quite willing to provide extensive information on fit, in exchange for getting well-fitted trousers. As we demonstrate below, switching costs are not only associated with the tangible and intangible investments needed to obtain and operate the necessary IT infrastructure, but they also include opportunity costs associated with abandoning the initiative to adopt competitors’ offers. For example, companies that have used an electronic procurement marketplace (e.g., Avendra in the lodging industry) for a considerable time would be unwilling to switch to a competitor's because of the substantial value of the historical transaction data accumulated.

For switching costs to raise barriers to imitation, they do not need to severely lock-in customers. They simply need to create incentives for customers to remain in the relationship (similar to the role played by frequent traveler programs in swaying traveler decisions, rather than locking them into a given brand). When this happens, competing firms cannot simply match the leader's offering, but they need to either compensate the customer for the cost of switching (e.g., long distance telephone carriers paying customers to switch) or provide enough additional value to justify the customer’s decision to absorb the switching costs - two potentially costly strategies. In other words, later entrants must be that much better where “that much” is measured by the magnitude of the switching costs. When substantial switching costs exist, significant barriers to imitation protect early movers.

Co-specialized tangible investments

When an IT-dependent strategic initiative is deployed it may require that the firm’s customers acquire the physical assets necessary to participate in the initiative. We refer to the total capital outlay necessary to obtain these assets as co-specialized tangible investments. These co-specialized tangible investments range from computer hardware and telecommunication equipment to software applications and interfaces between the existing customer’s systems and the firm’s IT (e.g., hotel franchisees buy costly interfaces for the franchising brands’ own reservation system. These interfaces become valueless if the property is re-branded). Most examples of this class of switching costs are provided by co-specialized tangible investments that stem directly from the adoption of dedicated IT and computer equipment. Another example is provided by maintenance and service contracts.

\(^9\) (Shapiro and Varian 1998 p.111) Also see this book for an excellent treatment of switching costs in the information age.
The extent to which the IT-dependent strategic initiative requires customers’ investments in co-specialized tangible investments determines the potential for strong barriers to imitation associated with the initiative. But the contribution of this response lag driver may fluctuate over time owing to the fact that switching costs associated with tangible investments tend to decrease over time as the useful life of the investment grows shorter. Thus, the strength of these switching costs may follow a reverse saw-tooth pattern whereby switching costs are greatest upon acquisition or upgrade of the assets (e.g., hardware and software) and degrades over time until the next investment is made. It follows that the firm’s leadership position is most at risk as the customer faces the cyclical capital outlay and renewal decision.

Co-specialized intangible investments

When an IT-dependent strategic initiative is deployed it often necessitates that the firm’s customers or channel partners make another type of investment to effectively take part in the initiative - co-specialized intangible investments (e.g., to benefit from customer relationship management initiatives customers often need to take the time to complete a profile). The costs associated with these investments may be financial, but it more often arises from investments in time. Co-specialized intangible investments may include “set-up” costs as well as ongoing costs (e.g., retraining of new travel associates using a reservation system). Common examples of co-specialized intangible investments include training specific to application and their interface, proficiency that users have achieved with the current technology over time, transaction costs associated with searching for and contracting with other partners, the creation of new relationships, the uncertainty surrounding switching decisions and the available alternatives—likely to be high with complex IT-dependent strategic initiatives, and the costs associated with migrating existing databases to new providers or new platforms. Data and information repositories represent perhaps the most important class of co-specialized intangible investments in the information age. Significant switching cost can be built on information accumulated over time (for example, when the data accumulated by the customer is only valuable as long as it is used in conjunction with firm specific compatible systems and it is impossible or costly to migrate to a competitor’s systems). A subtler example occurs when the information collected is only valuable as long as the customer is using the firm’s products or services (e.g., revenue management models and historical records that are brand specific and become valueless if the hotel is re-branded\(^\text{10}\)).

Unlike their tangible counterparts, the switching costs associated with co-specialized intangible investments tend to rise over time. As a consequence, IT-dependent strategic initiatives that leverage co-specialized intangible investments have the potential to build self-reinforcing barriers to imitation. For example, individual proficiency with software programs tends to increase as a function of time and use. A proficient end user faces significantly higher switching costs as time goes on because adopting a competing software application would depress productivity. The same dynamic occurs when switching costs are less apparent. Some forward-looking banks are attempting to leverage ubiquitous network connections to reach a position of “trusted consolidator” of top clients’ complex financial positions. This strategy entails the collection of significant amounts of information about customers’ banking profiles and current services, insurance holdings, investment portfolio, mortgage, credit and loan positions, scheduled bills payment, and so on.

The bank does not provide all of the above products, but it strives to offer a consolidated view of all financial positions by automatically retrieving and organizing the pertinent information. Assuming that customers find the service useful and continue to use it, the bank

\(^{10}\) The software here is not proprietary or brand specific, and the data is not accessed over a network or hosted by the brand. Yet, the historic data and the models the hotel has developed assume that the hotel has a given brand (e.g., Four Seasons). If the hotel is re-branded, while the software, the data, and the models are retained, their value is much lower because the data and models are specific to the original brand and assume the hotel sports the relative flag (e.g., has access to Four Season’s brand equity, reservation systems, loyal customer base).
can leverage this preferential position to enhance and deepen its relationship with them. Once competitors begin to offer a similar service, customers face switching costs that extend well beyond their proficiency with the bank’s software. In order to change provider they would have to research and evaluate competitors, compare feature/functionality, configure the competitor’s application, migrate historical data (if possible), open new accounts, close old accounts, and so on.

While a cursory examination may suggest that these costs are negligible, early research shows that even in markets with apparently negligible switching costs, like the money market mutual funds market, a significant entry order effect due to early mover lock in does exist. This result confirms that even when switching costs appear to be low, they can be critical for strategy. Interestingly, the absolute magnitude of switching costs is not the critical determinant of switching decisions. Rather, the relative magnitude of perceived switching costs to value differentials among competitors seems to be a much more important determinant of whether customers will be willing to leave established relationships for competing offers. This dynamic, where most powerful, requires later entrants to provide significantly higher value to “indemnify” customers of the switching costs they bear. As a bank executive we recently interviewed eloquently put it: “do not underestimate the power of entanglement.”

Collective switching costs

A unique form of switching costs is represented by collective switching costs. Collective switching costs are particularly strong in markets characterized by network externalities. They represent the combined switching cost of all entities in the network. Network externality refers to the disproportionate rise in a network value as each new user joins it. The massive market share held by Microsoft is a classic example. Much of the value users obtain from the dominant Microsoft Windows operating system result from the large community of users who are trained and comfortable with the suite of tools it supports (e.g., Microsoft Office). In the presence of network externalities, participation in the dominant network affords the most value to a prospective user who, by joining, contributes to increasing the value of the network as a whole. As a group, the participants face collective switching costs that exceed the simple sum of individual switching costs because unless a coordinated defection from the network occurs, any individual defector finds itself cut out of the network and its benefits. Only wholesale defection makes sense, but the coordination costs of wholesale defection are often daunting.

The emergence of a ubiquitous network infrastructure has created a number of strategic opportunities and has made possible the creation of communities of users to an unprecedented degree. IT-dependent strategic initiatives that foster the development of communities, and create network effects, hold the potential to leverage substantial collective switching costs and raise strong barriers to imitation. Examples of such initiatives include trading communities (e.g., eBay online auctions) or communities of interest (e.g., MCI Worldcom friends and family program, AOL instant messaging buddy circles).

Value System’s Structure

A firm does not engage in economic activity in isolation, but as a link in a larger value system including upstream and downstream members. The structure of this value system can provide significant opportunity for preemptive strategies and for the exploitation of the response lag drivers discussed above. Unlike response lag drivers though, the structure of the value system does not directly impact the strength of the preemption barrier to imitation. It plays instead a facilitating or inhibiting role. As described below, when the value system

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11 See the work of Makadok 1998.
displays certain characteristics, the effects of early mover response lag, such as switching costs, are maximized and they can have dramatic impacts.

**Relationship exclusivity**

A structural characteristic of the value system that magnifies the strength of the relationship between response lag drivers and the preemption barrier to imitation is the exclusivity of the relationship. An exclusive relationship exists when elements of the value system will elect to do business with one and only one firm providing substitute products or services. The firm’s counterpart (e.g., customer, supplier) places a premium on dealing with either the firm or one of its competitors, but not both. Relationship exclusivity is the norm with IT-dependent initiatives that provide integration services and that benefit from the accumulation of historical information. In the example (described above) of the banks attempting to consolidate all customers’ financial information in order to become the trusted consolidator, the purpose of the initiative is defeated unless the customer makes the relationship exclusive. When first introduced, the American Airlines SABRE terminal for travel agents created strong incentives for relationship exclusivity as travel agents did not want to waste valuable office space to place competitors’ proprietary terminals (e.g., United’s Apollo), which were considered essentially duplicates of the SABRE terminal.

Exclusivity strengthens the relationship between response lag drivers and the preemption barrier. When a business relationship benefits from exclusivity, the customer faces penalties for hedging behaviors and for sourcing the needed product or service from multiple firms. But by relying on only one firm, the customer becomes highly dependent on the firm and the effect of existing switching costs is magnified. When competitors introduce competing offers, customers are already invested in their relationship with the incumbent.

**Concentrated value system link**

The various stages of the value system in which the firm is embedded can be characterized as links in a chain (e.g., raw material producers, suppliers, distributors, firm’s customers, end consumers). The degree of concentration in the link is inversely proportional to the number of suitable business entities populating the link - where suitability depends on whether the firm would find the products or services offered by the entity populating the link acceptable. Thus, a highly concentrated value system link is one where there are relatively few organizations, or consumers, available for the firm to use or serve. In the case of airline global distribution systems, the total number of travel agents serving the market targeted by the airline sponsoring the system represents the concentrated link. In the case of fighter jets manufacturing, it is the pool of customers approved by the firm’s national government.

The degree of concentration in the value system link strengthens the relationship between response lag drivers and the preemption barrier. A market of given size will only support a finite number of competitors, and achieving a substantial penetration with the concentrated value system link - by definition a small market - is necessary to successfully preempt imitation. As the degree of concentration increases, the time necessary to secure a relationship with a significant proportion of the link decreases - all else being equal. Research in consumer goods has demonstrated that longer time-in-market, the period of time during which the early mover has the only available offer in the market, is reflected in the sustainability of competitive advantage as measured by market share. This time-in-market effect is attributed to the fact that, given more time, the leading firm has a better chance to successfully influence consumer learning, perceptions, and preference.

Similar dynamics likely influence the penetration of IT-dependent strategic initiatives. As the degree of concentration in the value system link increases, the proportion of link members that can effectively be reached, educated, and influenced in a given amount of time increases. Consequently the firm has a better chance of capturing a significant proportion of relationships
and be able to leverage switching costs to “lock out” competitors and maximize its barriers to imitation. Conversely, when a link in the value system enumerates a large number of business entities, the firm is unlikely to effectively reach a critical mass of entities and raise substantial barriers to imitation in the same amount of time.

**Conclusion**

This note has focused on the response lag drivers that strengthen the barriers to imitation of specific IT-dependent strategic initiatives and, in turn, the role these barriers play in fostering sustainable competitive advantage. We have presented a framework for thinking about, envisioning, and evaluating IT-dependent strategies for achieving sustainable competitive advantage. Clearly there is no easy path to sustainability, with considerable uncertainty surrounding investments and strategic directions. But the framework does provide a means for arguing against decisions that might otherwise seem straightforward. An obvious example is the decision to buy off-the-shelf systems that standardize valuable idiosyncratic business processes. On the other hand, it provides support for defending investments in infrastructure or in core IT capabilities. Most significantly, it suggests means by which IT can be employed to help sustain competitive advantage by exploiting the characteristics of the technology, the characteristics of the firm, or the characteristics of the value system in which the firm operates. As with any other competitive move, IT-dependent strategic initiatives are subject to the decay of barriers to imitation and the erosion of competitive advantage over time.
Bibliography


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