IT agility: striking the right balance
Information technology has revolutionized the way companies manage and compete. Yet, the evolution of IT is never-ending. Kishore Sengupta and Andrea Masini have investigated whether and how being technologically agile makes for higher corporate performance and whether an organization can be too agile for its own good.

In the 1990s, when mighty IBM was attacked on all sides by smaller, nimble PC makers (not to mention Microsoft), it had a very difficult time retooling itself. Not only did the company principally sell mainframe computers, its own information technology (IT) was built on a big rigid computer platform. We share this bit of techno history as an analogy, more or less, of what's happening today in a lot of companies. The computing world is very attuned to the law laid down by an Intel co-founder. Here's how Intel puts it on their own website: “Intel co-founder Gordon Moore is a visionary. In 1965, his prediction, popularly known as Moore's Law, states that the number of transistors on a chip will double about every two years. And Intel has kept that pace for nearly 40 years.”

As Intel goes, so goes the rest of the computing world. But what about your own company? You probably don’t work in the computing industry, but your company is likely overflowing with digital equipment. From accounting to manufacturing to shipping; it’s all computerized these days. The question is whether your company is as hunkered down (technologically) as IBM was in the ‘90s, or whether your company and its IT leadership are agile.

IT agility – the ability of a firm to adapt its IT capabilities to market changes – is increasingly suggested as an important organizational capability.

Yet, a review of the relevant literature suggests that the construct is still ill-specified, that it lacks reliable measurement and that its posited contribution to organizational performance needs further articulation and empirical validation. We’ve dug deeply into the subject and, after analyzing in detail the IT processes of almost one hundred companies, we have drawn some interesting conclusions. First, we posit that IT agility is of two different types: range-agility and time-agility. Then, we utilize this conceptualization to propose an approach for measuring IT agility in organizations and to examine its relationship with performance. While we have used our research lens to study the impact of different types of IT agility in large manufacturing companies, what we’ve learned has implications for many other organizations.

Types of agility and strategic options

Stated in an extremely simple way, IT agility is all about reconfiguring or replacing your information technology systems when new marketplace realities change the way you have to do business. While most studies we reviewed generically interpret IT agility as the ability to respond to changes in the external environment through appropriate internal adjustments, they implicitly refer to one (or more) of two evaluation criteria to gauge whether a firm possesses this ability. They consider either the extent to which an organization can respond to changes in the external environment - its range of agility - or to the time required to execute this response. Let’s take each type in turn.

Range-agility This represents an organization’s ability to broaden (or shrink) specific aspects of its capabilities. They include increasing or decreasing the repertoire of products and/or services offered to the market, or expanding or shrinking internal capabilities in manufacturing, services or processes. Adjustments in range can be accomplished by exercising options available internally (for example, better integration in processes or strategic business units), and externally (for example, via alliances and partnerships).

Consider National Bicycle as a good example. It is one of the largest Japanese bicycle manufacturers, an affiliate of Matsushita Electric Industrial Co.
In the early 1990s, National Bicycle managed to gain business value in a stagnating Japanese bicycle market, characterized by shifting consumer tastes, by improving variety in its offerings. Using robots, computers and advanced manufacturing technology that exploited proprietary software, it employed state-of-the-art techniques in bicycle production to manufacture custom-made products. According to one source, its product range was so large that customers could choose from about eight million possible combinations of model type, colour, frame size and other features. Thus, National Bicycle’s response to a stagnant market was to focus on range-agility.

**Time-agility** The speed of response, that is, the time it takes to retool one’s IT capabilities, is also important to think about. For example, some assert that IT infrastructures are considered to be critical in facilitating quick dissemination of new information and practices, especially in high velocity environments. However, such infrastructures themselves are often rigid and suffer from low time-agility; in particular, some researchers have wisely noted that legacy constraints (all the technology your company already has and uses) make it difficult for many organizations to make quick changes to their IT infrastructures.

The importance of time-agility is especially evident in research on development of IT applications. For example, some argue that when speed of response is critical, organizations can enhance competitive agility by shortening development cycle times of IT-based products, services and business applications. This view is also echoed by those who argue that a key property of agile IT systems lies in enabling faster times to market for new products.

In research on manufacturing systems, time-agility is typically characterized by the notion of mobility, that is, the ability to make temporal changes in the product mix. This ability to speed up product transitions and to reduce manufacturing set-up times is pointed out to be one of the primary characteristics of Japanese production systems. Similarly, the benefits of computerized machines and advanced manufacturing technologies have been ascribed to their ability to incorporate design changes rapidly for made-to-order products and to revise production schedules to accommodate demand volatility.

The clothing retailer Zara constitutes a good example of time-agility – as can be seen elsewhere in this issue. The market that Zara serves (urban shoppers 16–24 years of age) has very short windows of opportunities, sometimes lasting just a few days. When new trends emerge (for example, when the media broadcasts a movie star wearing a particular jacket at an awards ceremony), Zara needs to react quickly by copying the design, producing the items, and distributing them to their store network – all before the fashion effect fades away. Zara can successfully accomplish this because the IT system supports quick changes in product design, supplier selection, raw material acquisition, production and distribution schedules. In other words, Zara values time-agility.

**Relationship between range and time**

Our conceptualization of range and time stresses that these are distinct types of agility: they bring different business values to the processes they underlie and require different execution capabilities. Thus, the role of range-agility in the supply and demand management process (such as being able to significantly vary the number or variety of partners at any point of time) is different from that of time-agility (such as being able to switch rapidly among a limited number of partners).

Our example companies, National Bicycle and Zara, both seek agility for responding to changes in their respective marketplaces. However, the types of agility they seek for enhancing their business value are different. National Bicycle relies on range-agility, that is, the ability to expand (or more generally, control) simultaneous variety. Zara, on the other hand, is not focused on simultaneous variety: it desires the ability to control temporal variety. As one researcher made the distinction: “So in Zara’s shops, customers can always find new products – but in limited supply. Customers think, ‘This green shirt fits me, and there is only one on the rack. If I don’t buy it now, I’ll lose my chance.’”

Stated in an extremely simple way, IT agility is all about reconfiguring or replacing your information technology systems when new marketplace realities change the way you have to do business.
The characterization of the two types of agility conveys three implications. First, the types are not necessarily interchangeable. Thus, an organization seeking to improve one type of agility cannot fulfill its objectives by improving the other type of agility instead. National Bicycle needed a high degree of range-agility for meeting its objectives. In contrast to Zara, it was not particularly well served if it attained, instead, high time-agility (the market required more customized products, not faster deliveries of standardized bicycles). Moreover, the design of systems can preclude interchangeability in agility types. Thus, seeking improved range-agility through higher variety may not even be a feasible option if, for example, a manufacturing system is designed to make a limited set of products.

Second, there is a baseline of reasonableness underlying the types of agility. That is, when focusing on one type of agility, an organization needs to ensure that the other is at least within a reasonable threshold of implementation. Think of it this way: although the primary objective underlying National Bicycle’s program of custom-made bicycles was to broaden the product offerings, they also had to guarantee that the custom-made bicycles would be delivered to the customers within the usual two-week lead time. Similarly, Zara would have no hope of attracting trend-seeking customers if they were able to execute time-agility in only one or two offerings.

Finally, an organization can make investment decisions on improving one type of agility without necessarily seeking to affect the other type. In our examples, National Bicycle invested in technologies and processes to incorporate heterogeneous customer needs into their design, manufacturing and distribution processes and to deal with different suppliers (the increase of product variety implies a proliferation of suppliers). Candidate technologies included those that provided variations in scale and bandwidth and permitted interoperability for heterogeneous environments. In contrast, Zara may not be particularly interested in scale or bandwidth or even in heterogeneous interoperability if the industry players use similar standards. Thus, the IT capabilities that each player needs to develop are different: National Bicycle relies on sophisticated interoperable systems that can accommodate a wide range of options; Zara’s systems are relatively simple but time-agile.

### Types of agility and performance

As range- and time-agility can be considered critical IT capabilities, they are also expected to have a significant impact on the value creation process of a business organization. We considered the relationship between IT agility and organizational performance in a number of ways, testing various hypotheses and arriving at some interesting conclusions.

In general, range-agility provides firms with the ability to add variety to its products, routines and practices, as well as to create and sustain webs of collaborative relationships and extend reach. A firm can harness these capabilities to create value through a greater number and variety of new competitive actions as well as through a complex range of repertoires that are not easy to copy. Time-agile companies can seize opportunities for creating advantage through their ability to reconfigure processes and organizational resources faster than competitors. For example, by rapid propagation of engineering changes through agile IT systems, they can speed up new product development and establish early mover advantage. Companies such as Dell have outperformed competitors by creating time-agile IT infrastructures that support fast supply chain operations. In global supply chains, the ability to frequent-partner (that is, the ability to quickly establish ad hoc partnerships with other organizations) becomes a key asset in dealing with volatile demand and shifting customer needs. Finally, time-agile infrastructures enable companies to acquire and disseminate knowledge quickly, thereby providing advantages in dynamic markets in which the manipulation of knowledge resources is particularly critical.

However, a company could exercise range- or time-agility and not achieve all that it hoped. When resources are limited, dispersing investments across various capabilities or leveraging the wrong capability beyond a reasonable level may waste critical resources, thereby generating negative or...
diminishing returns. In general, our studies indicate that an increase in either range- or time-agility is beneficial for performance up to, but not beyond, a certain level.

Research findings from various fields provide support for this hypothesis. A model of a multi-product, multi-location production system has found diminishing returns to increasing range-agility beyond an optimal level. That is, a network of factories able to manufacture at least two product categories in the same site is more valuable than a network of fully dedicated sites. However, these benefits rapidly decrease and eventually disappear for further increases in the number of product categories that can be produced in the same site.

The notion of information overload also contributes to explain why increasing range-agility beyond an optimal level can have negative effects. Increasing range-agility increases the amount of information that an organization has to process and forces decision makers to ration their cognitive resources, which are limited. When the number of alternatives to evaluate exceeds their processing capabilities, managers use only a subset of these alternatives and often end up making sub-optimal decisions. In this way, agility can actually hamper performance.

The literature on dynamic capabilities suggests that increasing time-agility may have diminishing returns. While valuable up to a certain level, the ability to reorganize and reconfigure organizational resources becomes counterproductive if extended beyond an optimal threshold, because experience that accumulates too fast cannot be easily transformed into useful knowledge. A high degree of time-agility also alters the balance between the exploration of new processes and the exploitation of existing resources and generates competency traps. Companies that can shift resources too quickly tend to over-explore and reconfigure their processes before having the time to recoup their initial investments. In manufacturing environments, improvement projects based on rushed trial-and-error reactions to problems in the production process have been also found to exert a negative impact on performance. There are many other nuances that we explored in both types of IT agility. Yet, our major focus remained on the main point under study: does IT agility make a company more responsive in terms of a dynamic, competitive marketplace; and, if so, how? For instance, one aspect that deserves particular attention is the value of agility in environments that have different degrees of dynamism.

**Market dynamism and range-agility** Building range-agility requires managers to make specific decisions on how much manoeuvring capability to factor into existing systems, such as the extent of interoperability for data, levels of connectivity, ability to deal with volume fluctuation and product variety. This requires envisaging and making choices about external scenarios that are likely to unfold. Range-agility can be a useful asset when unpredictability is low. Many of the envisaged scenarios do play out; and incremental responses, such as adding features or altering volumes without altering the essence of a product, are sufficient to cope with environmental changes.

However, as market dynamism increases, so as well does the unpredictability of events, thus making less likely the occurrence of the scenarios underlying the organization’s range-agility capabilities. The ability to execute incremental changes in volumes or variety is no longer enough and can even be counterproductive: evidence from highly dynamic markets such as the microcomputer software industry suggests that incremental approaches such as extensions to existing products can actually hurt performance.

Thus, the benefits of range-agility are not open-ended: there are limits to how much can be built into capabilities, and therefore, how much value that an organization can extract from range-agility. When the competitive landscape shifts very unpredictably, the investment required to attain appropriate levels of range-agility may be so high that its net effect on performance becomes negative.

**Market dynamism and time-agility** When environmental dynamism is low, making continuous changes hampers the codification of organizational knowledge and hinders the development of structured procedures, or first-order capabilities, which are particularly useful in this context. Thus, in environments with low dynamism, privileging the time component may induce firms to sacrifice efficiency and process exploitation; and this may result in a situation in which time-agility capabilities are underutilized or the investments do not yield business benefits.
On the other hand, when market changes are unpredictable (as in highly dynamic environments), firms need simple and highly adaptable routines. Thus, privileging the time component for gaining the ability to achieve rapid adaptation can be highly valuable. Thus, the incremental benefits of time-agile systems are more likely to be better realized in highly dynamic environments.

Research on the subject of IT agility is really just beginning. And, here, we have not yet discussed the implications of range- and time-agility steps being taken simultaneously. For, indeed, the impact of one of the two variables can be altered when the other is leveraged at the same time. Let us at least highlight what we have found.

Our results show that both range- and time-agility have positive relationships with a firm’s ROA. Thus, both types of IT agility constitute valuable capabilities for an organization. However, there are two sets of bounds on the extent to which a firm can extract benefits from IT agility. First, the interaction between range- and time-agility is negative. Therefore, firms that rely on a combination of both types of agility for creating value – rather than making a choice between the two – are likely to experience difficulty in doing so. Second, companies can derive additional value from progressive increases in range-agility. For time-agility, however, this only works up to a point; higher levels of time-agility can be counterproductive to organizational performance.

The implication of all the research conducted so far, including ours, is that IT agility confers an option for managers that can lead to improved performance. However, the value of this option can also entail diminishing marginal returns and is contingent on the specific characteristics of the environment in which firms operate. This suggests that, rather than rushing headlong into agility-enhancement initiatives, managers should assess the agility needs of their organizations in the context of their environments, identify the agility enhancement mechanisms that are most appropriate to leverage, and then align their IT capabilities to attain the desired level of agility.

Resources

Kishore Sengupta (kishore.sengupta@insead.edu) is an Associate Professor in the Technology and Operations Management area at INSEAD.

Andrea Masini (amasini@london.edu) is Assistant Professor in the Management Science and Operations department at London Business School.