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Remarks on Pisano: "Toward a prescriptive theory of dynamic capabilities"

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1. Introduction

Gary Pisano's primary contribution in this paper is his effort to provide greater clarity around an important but underexplored issue in the dynamic capabilities framework, namely "capability identification, selection, and creation" (p.748). This is couched as part of a larger mission to flesh out "exactly what 'dynamic capabilities' are" (p.750). In fact, the abstract claims that "the research program on dynamic capabilities needs to be reset around the fundamental strategic problem facing firms: how to identify and select capabilities that lead to competitive advantage." As we will try to make clear, this is possibly a big step backward for dynamic capabilities research.

The paper has many strengths, on which we do not focus. In particular, Pisano's treatment of capability selection fits with the sensing and seizing elements of the dynamic capabilities framework. He rightly notes that two popular precursors of dynamic capabilities—Five Forces and the Resource-Based View—have almost nothing to say with respect to how a firm develops,

maintains, and augments its capabilities.[1] He also explicitly introduces strategy, which was embedded (though not spelled out in much detail) in Teece, Pisano, and Shuen (1997). It is quite explicit in Teece (2014).

A significant weakness is that Pisano's approach considers capability choices in relative isolation, whereas the dynamic capabilities framework—from the beginning and as it has evolved— demands a system-level perspective in which strategy, capability choices, and more are co-determined (Teece, 2014, 2018a). If capability choices were made in the absence of a product market strategy as Pisano's article suggests, they risk being incongruent. Other choices that should be considered at the same time as the capability/technology selection discussed in the article include business model innovation/selection and key complementarities among assets, activities, and organizational structures.

A second issue (but not necessarily a weakness) is that "general-purpose capabilities"—at least in the broad sense in which they are used in Pisano's article—are context-dependent, particularly with respect to industry lifecycles. Know-how that is applicable in an industry's early stage may become obsolete once a dominant design is selected. This is a subtler point about industry evolution than the evolving customer preferences that Pisano mentions in his discussion of "demand-side uncertainty."

A final issue is that Pisano's proposed capability dimensions may not be as useful as they first appear. The text implicitly defines capabilities as operational or "ordinary" (Winter, 2003). Indeed, Pisano's conception of capabilities borders on technological, and he limits the discussion

[1] This contrast has an analogy at the national level. Whereas economics views national differences in terms of resource endowments, competitiveness theory (e.g., Tyson and Zysman, 1983) argues that national advantage must be built in strategic industries by the decisions and actions of policymakers and managers.

of the selection mechanism to a "strategy ... defined by its pattern of search and the allocation of its efforts" (p.755). To us, this seems too narrow to represent the dynamic capabilities framework, and it plunges us back into the "endless debates about definitions" that Pisano is trying to bypass.

We discuss each of these issues in turn.

2. The Capabilities System and the Need for Alignment

Pisano is right to point out that the dynamic capabilities framework needs to incorporate criteria to help select among capabilities for development, augmentation, or divestment. He wants to make the framework more prescriptive in this regard, and his efforts to do so will no doubt be appreciated by practically all those who recognize the importance of the dynamic capabilities framework.

However, the dynamic capabilities construct is about much more than the selection of the right portfolio of capabilities. The questions of how capabilities are augmented and when and where they get deployed are also of great importance. These involve product market strategy, too; they are not narrow capability questions to be decided in isolation. Clearly, product market choices and capability investment choices are intertwined, and no one to date has provided much of a framework for aligning these two critical facets of business strategy.

By making product market strategy contingent on capability investments, as he does in Figure 1, Pisano is placing the cart before the horse. In the dynamic capabilities framework as it has evolved, it is more common for the sensing of new opportunities, driven in part by the recognition of the opportunities afforded by new technologies (whether developed internally or

externally), to lead to the identification of promising target markets. As Amazon's Jeff Bezos frequently notes, the customer must come first.[2] After product market opportunities have been calibrated and prioritized, the firm can then undertake an assessment to identify capability gaps to be filled internally or externally (Teece, 2017).

Teece's (2017) analysis of capability gaps proposed a qualitative, multi-dimensional metric of "capability distance" relative to the firm's existing resources. This distance includes aspects not only of technology but also of business models and markets. The greater the distance, the more difficult it will be to close the gap. Pisano gets at this with his notion of "strategically interesting" capabilities, which are neither trivial nor infeasible. Combining the two treatments, it seems likely that market and business model distances are less salient the more that a capability is general-purpose.

The point is that the choice of capabilities is contingent on (or needs to be made concurrently with) product market strategy. Pisano acknowledges this early on, noting that "Decisions about product market entry and positioning and decisions about capability creation are intimately linked" (p.748), adding that "The job of a capabilities-based theory of strategy should be to provide conceptual and practical insights about these links." But the capabilities analysis in the remainder of the article merely focuses on just two dimensions of capability choices and claims that they lead to product market strategies. The "intimate link" is severed. This lacuna becomes visible in the diversification discussion. During the description of Honda's entry into the light jet market on p.753, we aren't told that the company faced a choice between a

[2] In his April 2017 letter to Amazon shareholders, Bezos put "customer obsession" at the top of the list of ways to ward off "stasis... [f]ollowed by irrelevance." The full text is available at https://www.amazon.com/p/feature/z6o9g6sysxur57t

general-purpose and a market-specific capability but rather that its existing general-purpose capabilities needed to be augmented by a raft of market-specific capabilities. In other words, Honda had decided to make jets, and this decision determined its capability choices.

The paper more or less acknowledges the contingent nature of the capability selection process by noting that "certain strategies might require investments in specific combinations of new capabilities" (p.755). But this makes the sequence shown in Figure 1 all the harder to understand.

The underlying concern that leads Pisano to his oversimplification is that too much effort has been spent on divergent opinions about the general nature of dynamic capabilities without getting into the details of what they are and why they're valuable. However, by trying to get around the problem, he risks making prescriptions without a strong basis in theory.

Figure 1, in particular, gives an alarmingly reductive view of the dynamic capabilities framework. He reduces "dynamic capabilities" to a mediating influence on capability investments that arise from nowhere in a model of the firm with no feedback. If Pisano believes that dynamic capabilities truly "shape organizational adaptability" (p.750), then they logically drive capability investments (and, arguably, the product market strategies that he shows flowing from the firm's asset position). Moreover, the lack of any influence leading from "Product Market Strategies & Competitive Outcomes" back to "Capability Investments" is a serious omission.

3. General-Purpose Capabilities and the Industry Lifecycle

Pisano advances the notion that firms can choose between developing either market-specific or more general-purpose capabilities. He walks this back a bit by acknowledging at several points that the two are generally complementary in any given application, but the dichotomy is at the heart of his proposal for a capabilities strategy.

It is worth noting that capabilities can be general-purpose within a single industry, not just across two or more of them, as was the case with the examples in the article. An auto manufacturer can, for example, be a general-purpose producer, making a range of models (e.g., GM), or a specialty producer of high-end sports cars (e.g., Ferrari). While significant overlap may exist for different use cases (e.g., marine diesel engines versus truck diesel engines), extreme performance likely requires specialist rather than generic capabilities.

This is also a place where systemic notions of "congruence" come into play. Choosing to invest in a generic or a specific capability implies a path of investment in complementary assets, not just complementary capabilities. Toyota decided, for example, that making and selling luxury cars also required a new brand, Lexus, with a dealer network that was separate from Toyota.

A subtler issue is that general-purpose capabilities—at least in the Penrosean sense used here[3]—may not remain general-purpose indefinitely as an industry progresses through its lifecycle. The original Wright Brothers plane depended on the knowledge that the brothers acquired operating a bicycle shop in Dayton, Ohio. However, within a short period, efforts to improve technology for particular "use cases" (i.e., mechanical technology for aircraft versus

[3] For a discussion of general-purpose and enabling technologies in a more narrowly defined (but economically significant) sense, see Teece (2018b).

autos) led to technological differentiation along what Alfred Chandler (2001) calls "paths of learning" that lead to specialization.

From similar initial conditions, companies choose different investment commitments and different paths of learning. Thus, Rolls Royce with its roots in automotive technology, is still in aerospace (jet engines) whereas, say, Ford Motor is not, despite an early success with the Ford Trimotor. The difference can come down to entrepreneurial vision, timing, paths of learning, or government industrial policy.

It is perhaps little remembered today that, long before Honda's light jet, Ford Motor also made an airplane, exploiting the general applicability of its automobile engine technology to launch the Ford Trimotor in 1925. But the company exited the industry in 1936 after the success of its initial model ran its course and the prototype of a new design suffered a crash landing.

Engine technology remained general-purpose, and many car manufacturers, including Ford, Daimler Benz, BMW, and GM, produced aircraft engines during World War Two.[4] However, with the arrival of jet engines, paths of learning associated with autos and aircraft diverged completely, and most car makers exited aerospace, as did many other propeller aircraft companies (Phillips, 1971).

The point is that, while primitive versions of new products can rely on generic technologies, more advanced versions often cannot. Thus, the stage of an industry's lifecycle, which Pisano only raises in the context of consumer preferences, is another contextual dimension against which the generic-versus-specific choice should be considered. General-purpose capabilities can

[4] For example, the German Messerschmitt Bf 109 had a Daimler-Benz engine, and the US P-38 Lightning was powered by an Allison engine from General Motors.

lose some of their flexibility as industry verticals to which they might be applicable adopt dominant designs favoring highly specific solutions.

The flip side is that companies can adopt a "paths of learning" approach to close capability gaps in a step-wise fashion. Tesla's first product, for example, was the Roadster, for which the body was made by Lotus Engineering in the UK while Tesla focused on building and installing the all-electric powertrain. After four years, Tesla replaced it with the Model S, a low-volume, high-price model for which it also built the body in-house (capability broadening). In 2017, it began selling the Model 3, which it is currently attempting to ramp up to high-volume production (capability deepening). Thus, rather than attempting to compete head-to-head with incumbent auto firms from the outset, Tesla chose a strategy that permitted it to pursue a gradual broadening and deepening of its capabilities.

4. The 2 x 2 Matrix and the Nature of Capabilities

The core of Pisano's article is a taxonomy of capabilities and capability migration paths (general-purpose or market-specific; broadening or deepening). This is potentially useful, but the normative implications are by no means clear. The goal of the dynamic capabilities framework, as stated in the opening line of the abstract of Teece, Pisano, and Shuen (1997) was to provide insight into the "the sources and methods of wealth creation and capture by private enterprise firms". It seems overly reductive to now treat dynamic capabilities as a process for making a two-dimensional decision. The utility of Pisano's framework thus depends on grappling with the definitional ambiguity about capabilities that he wants to avoid.

For instance, the distinctions between broadening and deepening, or general and specific, are not typically as clear in practice as they seem in theory. This is in large part due to the complementarities noted in the article. Even the example of the Honda's light jet presents a challenge. This ambitious project required 29 years from conception to first delivery, which raises the question of whether it should really be considered "domain expanding" rather than merely "application expanding" (as it is shown to be in Figure 3).

Pisano's discussion of Penrosean diversification explores, without fully acknowledging, this complexity. And it also raises two issues.

First, he writes that "We currently have very little theory or even empirical understanding about what might make some particular body of general-purpose capability or market-specific capability harder (or easier) for some firms to acquire." (p.758). This is an odd statement as there is a sizable literature on absorptive capacity and technology acquisition that provides frameworks addressing this very topic (e.g., Walsh and Linton, 2011).

More importantly, the diversification discussion again ignores the systemic nature of capabilities. As Penrose herself noted, "a strong market position without technological competence is as precarious as is strong technological competence but weak selling ability" (Penrose, 1995, p.118). Managers strategizing the use of existing capabilities for diversification must consider not only technology but also market knowledge and business models. Given the emphasis throughout the article on technology and operations (even in the discussion of Virgin on p.756), it is unclear how broadly or narrowly Pisano defines a "capability".

5. Conclusion

Pisano's article can be read as an essay about technology risk and return without reference to dynamic capabilities. The capabilities (and "management practices") discussed are all technological or operational in nature, ignoring equally vital management capabilities such as business model innovation and organizational design and even related organizational routines such as merger management or product development. In the conclusion, there is a claim that "the framework suggests that general-purpose management capabilities rooted in such things as control and incentive systems, hiring and promotion practices, quality management systems, and corporate governance may contribute to performance differences across firms" (p.758). But anyone reading this paper would be hard-pressed to find any suggestion of even these (ordinary) capabilities in the rest of the paper. It seems likely that any effort to operationalize the research questions presented in the conclusion will end up looking at investments in products and process technologies, rather than at capabilities more broadly.

The treatment of uncertainty in capability development and market evolution is reflective of this overly narrow focus. Uncertainty is a critical strategic issue (see Teece, Peteraf, and Leih, 2016). Pisano's analysis of it includes a good, brief discussion of "supply-side uncertainty" about capability development and "demand-side uncertainty" about the ultimate value of new capabilities (p.759). It would be more accurate, however, to say that, with deep uncertainty, there is a premium to good sensing and sense-making, which involve the ability to scan both the demand and the supply side of the market to identify and calibrate opportunities and threats. Without this, investment in new capabilities (or in modifying existing ones) is unlikely to hit the mark. Put another way, the uncertainty can be mitigated somewhat if the necessary

entrepreneurial/dynamic capabilities are strong. Day and Schoemaker (2006) provide useful insights in to how to sharpen understanding of such issues.

Pisano observes that "a firm's capability choices are partially constrained—they are neither complete prisoners of the past nor can they change instantly and infinitely" (p.748). With this statement, he is taking a swipe both at evolutionary economics on the one hand and neoclassical economic theory on the other. While agreeing with this position, we note that it does raise the question of whether the dynamic capabilities framework presented this way puts us in a "no man's land" in the middle. This is perhaps more a disciplinary concern than a theoretical or practical one, but it merits future reflection.

Pisano has potentially advanced our understanding of the "supply side" of the dynamic capabilities framework by bringing greater granularity to capability choice. However, he did so at the risk of impoverishing the dynamic capabilities framework by underplaying the entrepreneurial management and systemic orchestration required to build competitive advantage. Perhaps in the future he will return more fully to dynamic capabilities research, from which he has been missed, and engage more holistically with elements such as how capability choices are made.

References

Chandler, A. D., Jr. (2001). *Inventing the Electronic Century: The Epic Story of the Consumer Electronics and Computer Industries*. New York: Free Press.

Day, G. S., and Schoemaker, P. J. H. (2006). *Peripheral Vision: Detecting the Weak Signals that Will Make or Break Your Company*. Cambridge, MA: Harvard Business School Press.

Penrose, E. (1995). *The Theory of the Growth of the Firm, 3rd ed*. Oxford: Oxford University Press.

Phillips, A. (1971). *Technology and Market Structure: A Study of the Aircraft Industry*. Lexington, MA: Heath Lexington Books.

Teece, D. J. (2007). Explicating dynamic capabilities: The nature and microfoundations of (sustainable) enterprise performance. *Strategic Management Journal*, 28(13), 1319–1350.

Teece, D. J. (2014). The foundations of enterprise performance: Dynamic and ordinary capabilities in an (economic) theory of firms. *Academy of Management Perspectives*, 28(4), 328-352.

Teece, D. J. (2017): A capability theory of the firm: an economics and (strategic) management perspective. *New Zealand Economic Papers*, In Press. DOI: 10.1080/00779954.2017.1371208

Teece, D. J. (2018a). Dynamic capabilities as (workable) management systems theory. *Journal of Management & Organization*, In Press. DOI:10.1017/jmo.2017.75.

Teece, D. J. (2018b). Profiting from innovation in the digital economy: Enabling technologies, standards, and licensing models in the wireless world. *Research Policy*, In Press.

Teece, D., Peteraf, M., and Leih, S. (2016). Dynamic capabilities and organizational agility. *California Management Review*, 58(4), 13–35.

Teece, D. J., Pisano, G., and Shuen, A. (1997). Dynamic capabilities and strategic management. *Strategic Management Journal*, *18*(7), 509-533.

Tyson, L., and Zysman, J. (1983). American industry in international competition: government policies and corporate strategies. *California Management Review*, 25(3), 27-52.

Walsh, S. T., and Linton, J. D. (2011). The strategy-technology firm fit audit: a guide to opportunity assessment and selection. *Technological Forecasting and Social Change*, 78(2), 199-216.

Winter, S. G. (2003). Understanding dynamic capabilities. *Strategic Management Journal*, 24(10), 991-995.