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Managing asset orchestration: A processual approach to adapting to dynamic environments

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ABSTRACT

The organizational ability to adapt to dynamic environments through asset orchestration is at the core of dynamic capabilities research. However, the theory remains vague regarding how firm assets are orchestrated, and the present study addresses this gap. We develop an asset-level framework distinguishing four modes with which dynamic capabilities influence assets and apply it on longitudinal, in-depth qualitative case data. Revealing managerial considerations regarding how assets are orchestrated over time, we propose the terms sequencing and balancing to denote how similar and different orchestration modes, respectively, are combined in the processes. We relate these concepts to managerial coordination and to achieving timely and appropriate organizational response to environmental dynamism. Avenues for future research and prescriptions to practitioners are suggested.

1. Introduction

Research on dynamic capabilities theory aims to explain how organizations survive or even achieve competitive advantage by adjusting firm assets in response to changing environments (Helfat & Winter, 2011; Makkonen, Pohjola, Olkkonen, & Koponen, 2014; Romme, Zollo, & Berends, 2010; Schilke, 2014a; Teece, 2007; Teece, Pisano, & Shuen, 1997). Thus, dynamic capabilities are generally considered "the capacity of an organization to purposefully create, extend, or modify its resource base" (Helfat et al., 2007: 1), including tangible and intangible assets and ordinary capabilities. Dynamic capabilities appear in a variety of functions, including analytical abilities (Wamba et al., 2017), alliance portfolio (Jiang, Tao, & Santoro, 2010) or network management (Mariotti & Delbridge, 2012), however, research has specifically highlighted dynamic capabilities in the context of product development as a central means of responding to environmental dynamism (Eisenhardt & Martin, 2000; Kindström, Kowalkowski, & Sandberg, 2013; Teece et al., 1997; Teece & Pisano, 1994).

Consider the case of Metso Paper, a division of the global Metso industrial corporation. It faced a period of market transformation, including a combination of interrelated unpredictable economic, technological, and demand shifts. Systemic efforts were initiated to re-establish its ability to develop, produce, and market its products globally. At the center of these efforts were substantial adjustments of the intangible and tangible assets owned by the firm or in its network, requiring coordination by decision-makers at various hierarchical levels and functions—a process resulting in the development of a timely solution to meet changing technological and commercial demands. Beyond illustrating a case of a successful organizational response to environmental changes, the Metso Paper case allows us to elaborate the process in which dynamic capabilities adjust firm assets, thereby addressing a gap in dynamic capabilities theory.

Much effort has been invested in conceptual development (Barreto, 2010), such as the higher layers of dynamic capabilities (Ambrosini, Bowman, & Collier, 2009; Salvato & Vassolo, 2017; Schilke, 2014b). Relatively less has been invested in how dynamic capabilities are implemented to respond to new circumstances (Barreto, 2010). Still, studies have identified the intersection between dynamic capabilities and assets as an important link for research (Newey & Zahra, 2009), and despite recent advances clarifying the importance of monitoring and orchestrating the width and depth of firm assets (Danneels, 2011; Sirmon, Hitt, Ireland, & Gilbert, 2011), concerns are raised that dynamic capabilities theory remains underdeveloped regarding how firms orchestrate assets (Mulders & Romme, 2009). Specifically, if theory is to explain how some firms manage to orchestrate assets in dynamic environments, the time dimension needs consideration since orchestrating appropriately but too slowly likely reduces competitiveness. Accordingly, dynamic capabilities research has explicitly called for more attention to how asset orchestration plays out over time (Leiblein, 2011).

This study aims to contribute to dynamic capabilities research by elaborating the process of how firm assets are orchestrated in response to environmental dynamism. We consider asset orchestration a process

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stretched out in time (Sirmon et al., 2011) depending on managerial action and how it is organized (Teece, 2012, 2014, 2017). We develop an asset-level framework based on established theory (Danneels, 2011) to analyze how dynamic capabilities orchestrate assets. Our case includes longitudinal, qualitative data spanning the entire managerial hierarchy and all major functions of the firm, illustrating asset adjustments in a product-development project designed to meet environmental shifts, reflecting the insight that product development is fruitful for studying dynamic capabilities (Salvato, 2009; Teece & Pisano, 1994). In the tradition of case studies of dynamic capabilities (e.g., Danneels, 2011), the findings illustrate a case of successful restoration of environmental fitness and Metso Paper as a global market leader, thereby demonstrating dynamic capabilities in action.

2. Asset orchestration

Strategic management research emphasizes the need for "fit" between organizations and their competitive environment, and dynamic capabilities research is particularly focused on how organizations remain competitive by adjusting resources, competencies, and ordinary capabilities, collectively referred to as assets (Teece, 2007) in order to meet potentially ever-changing conditions, especially substantial shifts in the competitive environment (Helfat et al., 2007). We regard dynamic capabilities as a learned and recurring pattern of collective activity involving managerial action (Teece, 2012) that gradually evolves by and with the purpose of adjusting firm assets to better fit new environmental conditions, a definition that largely overlaps with the majority of research (Barreto, 2010). Importantly, dynamic capabilities can exist at various levels of the organizational hierarchy (e.g., Pandza, 2011) and may or may not lead to the intended outcomes (Helfat et al., 2007). Despite a variety of definitions of dynamic capabilities (Barreto, 2010), this ability to adjust a focal organization's assets is a central component in the emerging consensus of dynamic capabilities research (Wollersheim & Heimeriks, 2016).

Specifically, we draw on the concept of asset orchestration (Teece, 2007) and explicitly consider this a process, or a series of actions taking place in time (Sirmon et al., 2011). Pitelis and Teece (2010, p. 1254) define asset orchestration as "the process by which managers make, build, acquire, deploy, and redeploy decisions with respect to assets/capabilities." Being an important dynamic capability, asset orchestration occurs through organizational knowledge-based and collective efforts (Winter, 2003). Orchestration can span the breadth of the assets controlled by a firm and involve the depth of a managerial hierarchy (Sirmon et al., 2011). Recent research has stressed the importance of managers and management for dynamic capabilities in general (Teece, 2014) and for asset orchestration in particular. Chadwick, Super, and Kwon (2015) highlight the role of CEOs for asset orchestration and point to middle managers as being essential for implementing orchestration. Collectively, research shows that asset orchestration represents what is arguably the central aspect of dynamic capabilities theory: how firms adjust their asset base to environmental dynamism.

In this context, we draw on Teece (2007), who uses the term assets to denote the intangible and tangible resources and ordinary capabilities allowing a firm to keep up with the current competition. Overlapping with the term ordinary capabilities (Teece, 2017), these are also labeled substantive (Zahra, Sapienza, & Davidsson, 2006), first-order (Winter, 2003), operating (Newey & Zahra, 2009), ordinary capabilities or assets (Teece, 2017), or simply capabilities (Felin, Foss, Heimeriks, & Madsen, 2012), but they are often collectively summarized as the assets or resources owned by or accessible in the network of a firm (Teece, 2007). Assets thus include the brand names, technology, network contacts, and basic operating routines (Ambrosini et al., 2009) needed for daily work to keep pace with competition but not necessarily offer a firm a lasting competitive advantage (Danneels, 2008; Winter, 2003).

But how do dynamic capabilities orchestrate such assets? Research has mainly focused on firm-level concepts (Barreto, 2010; Helfat & Martin, 2015) and developed a richness of loosely connected or partly overlapping terms. Beyond Teece's (2014) coordinating and integrating, learning, and reconfiguring, Zahra and George (2002: 186) focus knowledge assets and suggest dynamic capabilities can be equaled to "routines and processes by which firms acquire, assimilate, transform, and exploit knowledge to produce a dynamic organizational capability." Several concepts are suggested to define the purpose or context of orchestration. For instance, Makkonen et al. (2014: 2709) specify "leveraging" as deploying an asset in a new situation, regardless of how a specific asset is influenced. Similarly, Teece (2014) adopts a firm-level perspective and defines coordination and integration as "combining various resources in an entrepreneurial fashion, such as for the development of new products", an outcome that could, reasonably, be the result of the terms reconfiguration, or transformation, meaning the "recombining and modifying existing resources" (Teece, 2014, p. 333). In short, there is room for increased conceptual clarity regarding asset orchestration.

For the purpose of the present study, we propose an asset-level framework of four generic modes in which dynamic capabilities influence assets, called orchestration modes. It draws on and develops Danneels's (2011) taxonomy of accessing, integrating, developing, and releasing, in turn building on Eisenhardt and Martin's (2000) well-known concepts. It explicates the ways in which analytically separate assets are orchestrated by dynamic capabilities. Accessing and releasing implies assets entering or exiting the control of an organizational unit (firm, division, or department), while integrating (combining two or more assets) and developing (qualitatively altering one) relates to assets already controlled by the focal unit. Being generic, these modes are not restricted to a specific asset (e.g. knowledge), type of organization (e.g. firm, division, or unit), or function (e.g. R&D) nor intended outcome (product innovation, new market entry, etc.). Importantly, the framework allows us to analyze combinations of orchestration modes over time, or orchestration processes. A summary of our framework and how it relates to prior concepts is offered in Table 1 and is developed more in depth in the following sections.

To be of use to an organization, an asset must be controlled (but not necessarily owned) by it. *Accessing* assets involves adding assets from the outside to those already controlled by an organization or organizational unit in response to environmental shifts. This mode addresses the problems of lacking critical assets (Katila & Shane, 2005). The accessed assets can be similar, new, or different (Karim & Mitchell, 2000) from the assets already controlled by or accessible at the volition of the organization (Helfat et al., 2007, p. 4). In practice, this can take many forms: acquiring assets (Helfat et al., 2007) or capabilities (Pitelis & Teece, 2010) in factor markets such as investing in assets (Aral & Weill, 2007), through alliances (Schreiner, Kale, & Corsten, 2009) or corporate acquisitions (Makri, Hitt, & Lane, 2010).

We use the term *integration* to denote making do with, but changing the relationship between, the assets already controlled by an organization or organizational unit to better match new environmental conditions. In terms of organizational change, integration can take the form of applying controlled assets in new ways, such as applying existing skills to a new set of assets. This orchestrating mode can relate not only to integrating organizational units within the same organization in the short term, such as through modular forms (Galunic & Eisenhardt, 2001), but also extending by integrating across ownership boundaries, such as in networks (Capaldo, 2007) or previous ownership boundaries. For instance, following an acquisition, integration constitutes a separate process from that of acquiring a target benefiting from dynamic capabilities (Heimeriks, Schijven, & Gates, 2012).

In contrast, *developing* assets implies a qualitative change to a particular asset already controlled by an organization or organizational unit. Arguably, compared to the term creating (Danneels, 2011), the term developing emphasizes that assets are developed out of already existing and controlled assets, thus stressing the path-dependent nature

Table 1
Theoretical framework of the four asset adjustment modes.

Adjustment mode	Effect	Definition	Examples	Terms used in similar ways in the previous literature
Accessing	Inter-unit change	Increasing the scope of the asset base by adding new assets to those already controlled	Sourcing in factor markets through an M&A and alliances or joint development projects	Gaining (Eisenhardt & Martin, 2000), knowledge integration [from external sources] (Makkonen et al., 2014), investing and knowledge acquisition [of various IT assets] (Aral & Weill, 2007), orchestration [i.e., acquiring new assets] (Helfat et al., 2007), acquiring [assets or capabilities] (Pitelis & Teece, 2010), retention and extension (Karim & Mitchell, 2000), transformation [taking control of externally acquired assets] (Zahra & George, 2002), accessing external resources (Danneels, 2011)
Integrating	Intra-unit change	Altering relationships (both creating and deleting) between multiple existing and analytically separable assets	Related to products or markets, separated by timing, cost, and the learning of integration, such as skill transfer following an M&A, etc.	Adapting, integrating, reconfiguring (Teece et al., 1997), integrating, reconfiguring, leveraging (Eisenhardt & Martin, 2000), configuring and deploying (Helfat et al., 2007), orchestrating [in relation to other assets] and deploying [in relation to markets] (Sirmon & Hitt, 2009), [deploying and re-deploying of assets] (Pitelis & Teece, 2010), integrating and reconfiguring [of knowledge] (Prieto, Revilla, & Rodríguez-Prado, 2009), exploring [market and technology] (Danneels, 2008), leveraging (Danneels, 2011)
Developing	Intra-unit change	Altering the qualitative properties of an already controlled analytically separable asset to allow the achievement of new outputs or similar outputs in new ways	Benchmarking, the gradual development of processes, exploiting assets, and organizational/individual learning	Exploiting [incorporating external assets by refining and applying existing assets or creating new assets] (Zahra & George, 2002), learning (Danneels, 2008), creating resources (Danneels, 2011), [knowledge] generation (Prieto et al., 2009)
Releasing	Inter-unit change	Abandoning control over an asset	Closing and disposing of assets that are less used, such as allowing cannibalization between assets	Releasing (Eisenhardt & Martin, 2000), [implicitly] disposing (Winter, 2003), [openness to] cannibalizing (Danneels, 2008; Teece, 2007), dropping resources (Danneels, 2011), divesting (Moliterno & Wiersema, 2007)

of this orchestration mode. This refers to the notion that specific, functional capabilities evolve linearly (Pisano, 2017), e.g., through learning (Ambrosini et al., 2009) and knowledge development (Prieto et al., 2009). Learning can be organizational or individual, representing developments in behavioral and activity patterns (Teece et al., 1997). It has also been associated with learning from within the organization through benchmarking (Eisenhardt & Martin, 2000), investments in research and development (Teece, 2007), and incremental, only partly intentional, improvement efforts by strategic management (Haleblian, Kim, & Rajagopalan, 2006).

Releasing assets controlled by an organization or organizational unit is a fourth orchestration mode. Assets that are attributed limited strategic value are a burden to firms (Teece, 2007), potentially making a firm inflexible (Leonard-Barton, 1992), adding to costs (Helfat et al., 2007), and shackling it to unprofitable businesses (Gilbert, 2005). In practice, releasing includes scrapping, selling or divesting assets (e.g., Laamanen, Brauer, & Junna, 2014) or deliberate cannibalizing in which current business is challenged by forward-looking endeavors (Danneels, 2008). In summary, our asset-level framework extends Danneels' (2011) terminology and is useful for analyzing how dynamic capabilities operate on assets during orchestration processes.

3. Data and methodology

This study was part of a research program on organizational capabilities in leading global industrial corporations. As one of the firms studied, Metso Paper provided a strong case for theorizing on successful asset orchestration in response to environmental transformation, thus complementing extant case studies (Danneels, 2011; Kindström et al., 2013). The study was conducted as an abductive embedded case study (Dubois & Gadde, 2002), focusing longitudinal data on a clearly delimited change effort constituting a primary part of Metso Paper's efforts to reestablish environmental fitness. Benefitting from extensive access to leading actors, this study answers to calls for rigorous, in-depth research (Easterby-Smith, Lyles, & Peteraf, 2009) and fine-grained data on dynamic capabilities (Ambrosini et al., 2009). Complementing extant process research on dynamic capabilities, we adopted a clearly process-oriented method of analysis (Langley, Smallman, Tsoukas, & Van de Ven, 2013).

3.1. *Case selection and research setting*

Following traditional case-study methodology, our case was selected to optimize the quality of data concerning a focal phenomenon (Eisenhardt & Graebner, 2007). Part of the Metso Corporation, a global heavy industry firm based in Finland with more than 10,000 employees, Metso Paper in Karlstad AB (Metso Paper) designs, produces and markets tissue-paper machines globally. It fulfills the accepted criteria for dynamic capabilities (Helfat et al., 2007): it handled a period of market transformation successfully in the last decade, remaining continuously profitable and a market leader with a market share of 30% after the study. Metso Paper constitutes a self-supporting unit responsible for developing, producing, and marketing tissue papers globally, with operations and R&D, the latter involving approximately 40 employees, concentrated in Karlstad and in minor units in Italy and the United States. Fulfilling these conditions, Metso Paper thereby represents a fruitful case for studying the orchestration process as a means of better understanding how dynamic capabilities make it possible to reestablish environmental fitness in dynamic conditions.

3.2. *Data collection*

Early in the fieldwork, it became apparent that the majority of the adaptations to environmental dynamism were being channeled through a product development project, illustrating product development as a dynamic capability (Salvato, 2009). To increase data density, we focused the data collection in the project, eventually spanning approximately 20 core members. Typical of these types of initiatives, the efforts and capabilities involved in contributing to the launch of a new product (Marsh & Stock, 2006) were partially planned and partially evolving. Importantly, the interviewees defined the project as a success (cf. Brown & Eisenhardt, 1997): reaching planned technological goals on time and reestablishing the firm as a market leader.

Data collection began in January 2008 and lasted 36 months, occurring simultaneously with the primary part of the development project and recording most key developments in real time. We conducted 38 semi-structured, formal personal interviews with 27 individuals, representing nearly the entire hierarchy and breadth of functions in the firm, covering all central roles of the project; the most central individuals such as senior engineers were interviewed several times. An interview guide allowed us to focus on and follow interesting new leads. Each interview lasted between 45 and 75 min, averaging approximately one hour. All interviews partly overlapped on topics to allow comparison and validation.

A first interview phase took place in early 2008. We interviewed the CEO, heads of departments, team managers, and senior engineers. This phase clarified the firm's history, current market position and market trends, strategy, and the role and structure of the product development organization. The early findings drew attention to a project aimed at developing a new type of tissue-paper machine in response to a recent environmental change: the NTT. We conducted a second round of interviews in 2009, focusing on new product development, particularly the NTT project, with team managers and senior engineers, in addition to the CEO and one department manager. These interviews covered the persons involved, project initiation and progress in terms of relatively distinct empirical asset adjustments, with emphasis on the order of events. A third interview round in 2011 continued to focus on the NTT project and its integration in and inputs from the organization and its network. Again, team managers and senior engineers were interviewed in addition to division managers and representatives from marketing and sales. Doing so increased the precision regarding formal roles in initiating key project decisions, revealing lateral and vertical cooperation.

Detailed accounts were written based on extensive notes in connection with each interview when the participants felt uncomfortable discussing confidential information on an audio recording. The remaining 32 interviews were audio recorded and transcribed. To obtain feedback and validate the initial findings, we conducted two group interviews following the second and third rounds of formal interviews: in 2009, the initial findings were presented and discussed with a handful of former interviewees, allowing us to both validate and extend the findings related to the focal project, centering on engineering; the second group of interviews, conducted in 2011, was similar to the first but also included non-project participants (both former and new interviewees), establishing an understanding of the interactions between product development units and other functions in the firm.

Internal and external documents primarily validated and contextualized the interview accounts. The documents comprised the equivalent of 180 pages of text, including new product designs, market plans and sales figures, project overviews, public annual reports, internal planning, and partly confidential management documents related to formal organization, strategic plans, and industry data, in addition to corporate, business, and technology strategy documents. A summary of data-gathering sessions and sources is shown in Table 2. Not noted in Table 2 were the numerous informal conversations that were held with key informants who were heavily involved in the NTT project.

3.3. Data analysis

Although initial ideas were written down during fieldwork, the primary analytic effort occurred after data gathering when all

Table 2
Data gathering in the NTT project and fieldwork outcomes.

Activity	Timing	Formal interviews	Informal interviews	Documents	Main topics covered	Sample interviewees
First interview round	January 2008	13	Four informal conversations (45 to 60 min) with three top management executives	Organizational charts, product range overview, product development planning documents, annual reports	The firm's market position, environmental shifts, firm history, and product development organization, with a focus on work processes in new product development	Vice president of tissue business, research manager, dry-end product manager, CEO, construction manager, DCT product manager, etc.
Second interview round	November 2008	13	Two 1-hour informal conversations with three engineers involved in the NTT project	Technical documentation material regarding the NTT product, documentation about cooperation partners	Internal organizing of the NTT project: key people involved, processes, actions taken, the timing of events, internal and external dependencies, etc.	Vice president of tissue business, research manager, design engineer (in construction), senior design engineer, design engineer (responsible for new innovations), team manager (construction, wet-end), etc.
Group interview I	September 2009	One (a 3-hour session with six firm participants)	(none)	(none)	Validating the understanding of the project and data (i.e., times, people, and concrete effort)	Vice president of tissue business, construction manager, research manager, CEO, dry-end product manager, design engineer
Third interview round	December 2011	12	Four half-hour informal conversations with a senior engineer, the CEO, and a marketing specialist	Marketing plan, product launch presentation material, written data on the firm's history	NTT project in its organizational and network context	President of tissue business, corporate HR manager (Metso Paper), sales and R&D (research department), financial controller (MP Karlstad), construction manager, etc.
Group interview II	December 2011	One (a 2-hour session with four participants)	(none)	Product specifications for the NTT machine	Validating collective project efforts leading up to the product launch and their timing	Marketing manager, (external) marketing consultants heavily involved in NTT, construction team manager, senior design engineer
Five on-site data-gathering sessions	Data-gathering spanning 36 months	38 formal interviews, two group interviews, providing more than 400 pages of interview material	Ten informal conversations with key informants in the project	Approximately 180 pages of written material contextualizing the project	Providing an in-depth view of the firm, its history, environmental shifts, and the firm's organizational response	All hierarchical levels and firm functions; all central roles in and around the project

transcriptions, notes, and internal and public documents were collated. Nonetheless, typical of qualitative case-study methodology, the analysis was highly iterative, vacillating between data and theory (Eisenhardt & Graebner, 2007). We prepared a case description of approximately 50 densely written pages for within-case analysis, establishing e.g. the organizational structure of the firm, its operations, strategy, and market position. Given the importance of the NTT project to the firm's adjustment to environmental dynamism, this project became our unit of analysis, and we used its initiation as the starting point for our analysis.

We used an inductive approach to identify assets, following how the interviewees talked about them, what they were, and where they started and ended, allowing us to identify analytically discrete assets. Empirically, these spanned categories identified in earlier research—-from physical and financial to personnel, organizational skills, and knowledge resources (Teece, 2007, 2014). Despite these differences, they were all recognizable by being adjusted during product development to meet changes to the environment.

We then proceeded to identify relevant analytically discrete and purposeful collective processes that adjusted firm assets, validated through a triangulation of the interview accounts. Following our framework, we paid close attention to whether adjustment affected assets already controlled by our unit of analysis (the NTT project) added to the project, e.g., from other parts of the organization, or released from it. The analysis focused on the temporal progression of activities that explain evolving phenomena (Langley et al., 2013). Zooming in on "micro-level dynamics and [identifying] driving forces of change on that level" (Becker, Lazaric, Nelson, & Winter, 2005, p. 776), we analyzed the relative timing of the initiation of primary efforts in the data. Since the daily stream of activities is perpetual and difficult if not impossible to delineate unambiguously, we followed the recommendations by Foss, Heimeriks, Winter, and Zollo (2012) and used expressed decisions in the data as punctuations that signaled the initiation of asset adjustments in response to external dynamism. In practice, we structured the data from multiple interview accounts in tables, revealing patterns characterized by a common purpose (Johnson, Langley, Melin, & Whittington, 2007), with formal decisions or first significant actions as starting points and analytic separators of each asset adjustment.

We drew on the interviewees' descriptions of hierarchical levels, separating, e.g., between the corporate level, the division manager, local department managers (e.g., R&D), team managers (e.g., Construction team), and individual engineers. Doing so resulted in a timeline or progression (Van de Ven, 1992) of asset orchestration and a pattern of when different orchestration modes were initiated and by whom. As we proceeded, we also revealed how each orchestration related to past and subsequent (planned) orchestrations, all continuously supervised by managers at various hierarchical levels. This analysis of actions was iterated between authors and compared against theory several times until stable patterns emerged (Eisenhardt & Graebner, 2007), and it was corroborated with interviewees during the second group interview.

4. Results

4.1. Background: A period of market transformation

The NTT project played out against a backdrop of market transformation involving interrelated changes in technology, customer preferences, and economic outlook that had seriously threatened the competitiveness of Metso Paper. Traditionally, the firm, with some 500 employees in central functions, product development, marketing, and production in Karlstad, Sweden, had focused on an upmarket technology labeled TAD (through-air drying), which produces a softer, more absorbent tissue that is considered more luxurious but requires more energy than the standard DCT (dry crepe technology). Saturation of traditional markets in North America and Europe in the early 2000s coupled with growing demand from China required catering to new specifications in new customer relations. Chinese customers remained unimpressed by *avant-garde* technical solutions requiring higher skill, maintenance, and development costs. They demanded robust "best available" solutions and, not least, smaller machines to compensate for the lacking infrastructure for transport to remote regions. Simultaneously, this was just the type of product that an increasing number of Asian competitors, some with a lax relationship with patents, could produce, further reducing margins. According to the new head of the tissue division:

> We have several concepts [paper machines technologies] in the marketplace. And the concept that's the most common is the DCT. It has become so competitive that there are many suppliers in the marketplace. So, every time you try to sell the DCT, you meet a lot of competitors, and you're fighting for projects where margins are typically very low.

In addition, the then-recent financial crisis had created a shortage in customer financing, causing industry sales figures to dip. Uncertainty over energy price trends created a general reluctance to invest in paper machines, particularly the upmarket TAD technology, altering the competitive landscape. Metso Paper was not alone in noticing these changes or in attempting to be the first to master them. That same year a competitor, Voith, openly expressed its ambitions to develop a new technology to meet the new conditions, using less energy and offering increased flexibility. This open statement was interpreted by key staff at Metso Paper as a signal of commitment to take up the fight for technological leadership. Overall, Metso Paper observed traditional technologies facing lower margins and the need to cater to the new requirements of new customers, while its leading upmarket position was squeezed between competition and inexpensive copies, all eating away at the company's market share.

4.2. A new technology in response to environmental changes

Continuously surveying the market using its own staff—gathering reports from sales personnel, drawing official market data, and buying intelligence reports—these changes were known to the strategic decision-makers at Metso Paper. To address this market transformation, the division manager of the tissue business line, appointed in 2005, ordered the development of a new technology, which came to be the NTT project—New Tissue Technology. To present his idea, the division manager gathered a handful of his subordinates from the global development units in a meeting several months later. Stressing the urgency of the situation, he concluded that the way forward was a technological leap. He describes his line of thought:

> In every business, I guess you look for new technology to elevate your business, to give you more edge in the market and more opportunity with the customer. […] So, what I asked for with this NTT concept is to do several things for the customers. The customer is always looking to reduce his costs and increase his margins. So, I was trying to solve his problem and our problem at the same time – to make a more competitive machine for ourselves, something different, and something that benefits the customers as well – all in an effort to get more margins on the machine.

This met with positive reactions from the other participants at the meeting, but while applauding the ambition, some remembered viewing the technical aims as asking for something that was nearly impossible. Notably, combining lower energy consumption with higher-quality, more absorptive tissue paper meant taking on two of the main challenges in R&D. One engineer noted, "It was more like a vision; I wouldn't say unattainable, but a very, very ambitious goal." However, if successful, Metso Paper could meet the new environmental situation, and immediately after the first meeting, the project started. A first version of the technology was developed in 2006, and in September 2008, the NTT was presented at the biannual tissue marketing event

Table 3
Temporal pattern of orchestrating processes in the NTT project.

Sequence	Categorized empirical asset adjustments	Empirical context from the case data
1	Accessing initial assets for the project	Initial and gradual staffing according to the project ramping up model for formalizing projects, adding a steering committee, a project manager, and two engineers
2	Integrating knowledge assets	Gathering existing and new technologies from various parts of the firm to select the most viable technology candidate
3	Accessing further labor and widening the scope of the project	Competence from adjacent units such as marketing and test facilities
4	Accessing the technological assets necessary for the project	Upgrading the pilot plant to increase its technological flexibility (requires corporate approval)
5	Releasing assets to balance costs	The disassembly, scrapping, and writing off of an unused pilot plant to balance investments
6	Integrating competence assets from project members	Drawing on cross-departmental contacts in the project, including marketing, sales, and after-sales initiation teams
7	Integrating existing knowledge assets over time	In line with regular development projects joining existing machine elements and existing patents with new technical solutions
8	Accessing assets outside of the firm	Formalizing joint research agreements with established suppliers of crucial and specialized machine components (chemicals and belt)
9	Developing knowledge assets by focusing research efforts	Enabling efforts in the NTT project by allowing assets to be freed by reducing the number of ongoing projects
10	Accessing personnel assets to the project	Regular escalating of asset commitment by increasing the number of engineers involved in the project and increasing testing in the pilot plant

held by Metso Paper's newly equipped test facility, and one engineering manager remembers “rolls of tissue paper [being] handed out to seminar attendants since seeing [the actual paper and how it is made] is believing.” The project had succeeded in producing a highly innovative and path-breaking tissue-making process. With a lower consumption of energy, pulp fiber, and water, it was a technological success compared to the traditional DCT, and it made tissue paper softer and more absorbent than the more up-market TAD technology. Metso Paper proudly called the NTT the “next generation of paper machines,” which was reflected in commercial success. The industry and customers showed major interest in paper machines using the new technology, labeled Advantage NTT, and the firm regained its leading market position.

4.3. Temporal patterns in asset adjustments

The new technology was the result of asset adjustments combined over the duration of the project. Each adjustment was empirically unique in duration, the number of employees involved, and the types of assets adjusted but conceptually and distinctly recognizable using our orchestration mode framework. Ten adjustments occurred during the project. These are summarized chronologically in Table 3. Moreover, our analysis revealed temporal links between each orchestration, in addition to the involvement of different managers, detailed chronologically below.

Along with the announcement of the project came the division manager's decision to access the assets required to initiate it. The overall responsibility for the project was assigned to a steering committee representing research and development, sales, and marketing. The committee was assigned the task of leading and supervising the work and appointing personnel who would be operationally responsible for initially running the project: a part-time project manager and two engineers dedicated to producing blueprints and performing initial calculations. The design responsibilities were divided following two main sections of the machine, as described by one engineer involved early: “At the beginning of the NTT project, there were two of us: one in the wet-end and one in the dry-end.” This limited initial effort reflected the typical gradual start-up of projects at Metso Paper, and the project was, in the words of a senior development engineer, “very thinly staffed,” and following standardized internal procedures, the initial asset commitments made the project revolve around six employees on a mixed full- and part-time basis and only later involved key personnel from other research sites.

As a second move, project members gathered to integrate existing and new technologies representing existing but previously scattered organizational knowledge assets. During the first four months, top engineers from various research and construction units in Italy, the United States, and Karlstad took stock of the existing ideas for new technologies, old patents and unused ideas as well as technical suggestions made by engineers in previous years. The steering committee then awarded points and ranked ideas according to the expected quality of the produced paper, cost, runnability, or how production would operate under real conditions, and technological risk for the remaining development. The winning concept (complete paper-making solution) won partly because it was expected to carry less technological risk over more technologically progressive solutions. Consequently, the first development steps were described as simple: a senior engineer sketched the construction on a piece of paper, turning a section of the traditional DCT solution upside down, “adding an element, and running the process something like this.”

The competition was not complacent. In 2006, Voith launched its ATMOS technology, combining the soft quality of the luxurious TAD-made tissue with low energy use, thus challenging the market niche that Metso Paper considered its own and forcing Metso Paper to intensify its efforts with the NTT project. The initial ideas and early considerations were further concretized using CAD, still largely under the supervision of department managers. Based on the first blueprints, the project entered implementation whereby a handful of engineers started detailing the design, requiring input from outside the development unit.

Once the technical direction was established and the first designs were ready, accessing additional assets to the project became central. To ensure not only technical but also commercial viability, employees from other units and departments were contacted and formally tied to the project. Typical of the low-key, hands-on engineering culture at the company, these asset additions required only informal contacts by team members or department managers. For instance, the project manager secured assets informally during daily contact with colleagues from other units. With increasingly specific ideas about the overall technical solution, important details were addressed, and consequently, the NTT project left the phase during which it could be managed using computer-based design tools or limited mechanical testing, or “bench tests.”

With the increasing refinement of the design, the need for ensuring concept viability increased, requiring access to substantial assets. This occurred in full-scale testing in one of two pilot plants: a full-scale but adaptable tissue-making machine. In the words of one engineer, there were “A project manager, a steering committee from sales, and of course several people working in the pilot plant test facility, all highly involved.” These flexible pilot plants were used to test new technological solutions in near-real-life conditions. The turning upside-down of a machine's section, compared to the layout of DCT machines, caused concern. Although the first test runs had been made with a traditional set-up, engineers soon realized the need to modify the pilot plant to allow it to be rebuilt in the same manner as the planned design, which required substantial investment outside of the mandate of local management. One engineer explains:

> We made a simple calculation: what does this cost? Then, [the head of the division] went to corporate headquarters and said, "We need 8 to 9 million SEK [approximately US$1.2 million] to get this going."

Although costs were covered at the division level, the size of the investment required approval from corporate headquarters in Finland. Although a standard procedure, corporate approval from Finland came within weeks, triggering intense preparation for rebuilding the pilot plant and rescheduling the planned tests: "[Finland] said, 'Ok, you've got it,' so we made a plan, time schedule, everything for refitting the Pilot Plant." This access to assets had a direct bearing on the NTT project by increasing technical flexibility; however, it also had effects that management was forced to consider during the next step of the project.

To balance costs for this investment, the division manager also decided to cut costs. Prior managers had been reluctant to write off a loss for a second pilot plant, acquired initially for a joint venture that never materialized. Standing idle, it added to the cost base, and the division manager made a quick decision: "Without very much discussion, I said, 'This one is stopped.'" In addition to writing off losses, processes could be concentrated, thus reducing the per-hour overhead costs for the remaining pilot plant and, therefore, counteracting prior cost accumulation in the project.

As technical aspects were developed and the project followed the normal scaling up and drew from an increasingly broad asset base, there became an increasing need to explicitly integrate different competence assets. Beyond contacts between construction and development departments, for instance, one example was the need to avoid patent infringements and to identify whether filing for patents was necessary. Considerations extended beyond mere costs, as explained by one senior research engineer:

> Patents make strategic technology immediately transparent to competitors. So, now we decide whether you file for patents or use the technology but not file for a patent. Compared to earlier, our patent strategy is much more advanced, and the competitive landscape forces us to have it.

In another example, important work involved ensuring interoperability across the intersections between different segments of the machine. In line with the low-key engineering culture of the firm, these improvements were described as only minor technical advances, albeit still important. This integration also involved ensuring input from marketing experts probing customer demand, competition, and market trends for further dynamism. Since these competencies were tied to the project, it was a matter of integrating the knowledge assets that existed within the project.

The initial decision not to go for the bolder technology but, instead, to opt for established solutions had benefits but also called for additional, and distinct, asset integration. In essence, the novelty of the NTT concept was in the manner in which pulp was transformed into paper in the mid-section of the machine, rather than in revolutionary new technology. This meant that many technological solutions were already in use or had been developed as early as 1996. Although critical to runnability, this was considered to be minor in terms of engineering skills, and one research manager explained, "Components were the same and used in the same way. So, we know how to adjust the components." Hence, although the production process was revolutionary, it built to a large extent on existing and previously developed parts not yet taken into use. As the R&D manager described, "It is quite a conservative industry since machines last for many, many years. So, we had a 10-year-old patent on the idea we finally developed further."

The main challenge involved ensuring sufficient interplay between parts under a highly complex co-dependent influence from factors such as varying rotation speeds, vibrations, temperatures, and humidity. Rather than depending on computer calculation, this required integrating experience developed over years. Pointing to the limitations of computers in handling such complex conditions, the research manager remarked:

> I wouldn't say that we calculate a lot. Instead, you have a lot of experience of how to run a machine like this. If you have that knowledge of that process, you have a lot to transfer to a new type of process.

Concretely, this took the form of informal conversations in corridors or standing in front of a computer screen to "point and discuss." In addition, regular meetings were scheduled once or twice a week, and as a part of ongoing, everyday work, it involved mainly the engineers or R&D and construction manager level.

Once reaching a certain stage of completeness, competencies for the development of the new technology also had to be accessed externally, drawing heavily from an established network. The chemicals used for making pulp had to be considered when designing the machine, and an exclusive agreement signed in December 2005 with Hercules, a long-time partner, meant reduced uncertainty for the NTT engineers compared to new chemicals potentially changing pulp characteristics. Additionally, a new type of belt for conveying the pulp through the machine was central to the new technology. An exclusive agreement was signed with Albany, Metso Paper's belt supplier, in 2006, that also impacted the running of the machine. These instances represented more than contacts and, instead, involved accessing knowledge assets from outside of Metso Paper. Concretely, engineers from the two firms were "very, very deeply involved," one Metso Paper engineer recalled.

Despite relying heavily on existing technologies, the project involved managerial intervention to ensure the development of new knowledge assets. The newly appointed head of the tissue division decided to boost development in the NTT project, however faced limited resources. In a review of ongoing projects, the division manager found that several projects at Metso Paper (spin-offs from earlier projects) lacked clear goals and closing these could achieve a faster development of new knowledge assets for the NTT. As a result, efforts were made to finalize a new technology for flexibly pressing out water from the pulp to be included for the first time in the NTT, directly relating to the energy savings craved by the market. Concretely, this meant closing six out of ten ongoing research projects while keeping the four related to the NTT project. Described by the division manager, "the difference is that we cut back on R&D and we had more management involvement in the NTT project."

As the project entered its last phase, additional assets were needed. What previously had been left as conceptual development had to be concretized. For instance, what motors should be used in the machine to adjust, e.g., pressures were not critical earlier but now needed to be decided. Doing so required accessing additional staff, such as specialists in hydraulics and electronic machines. Blueprints had to be developed at a detailed level for every part, cascading "like a tree." Work with final developing, building and testing also required more engineers from various departments. A construction engineer explained:

> The deeper you go, the more people are involved. So, we ask for help from the Automatization group. It increases stepwise but in total… eight to ten people.

Again, this increase in assets was considered normal at this stage of a project and was coordinated at the operational level and completed the NTT project. What had started as an ambitious project to respond to environmental dynamism was finalized by 2008, reestablishing the firm

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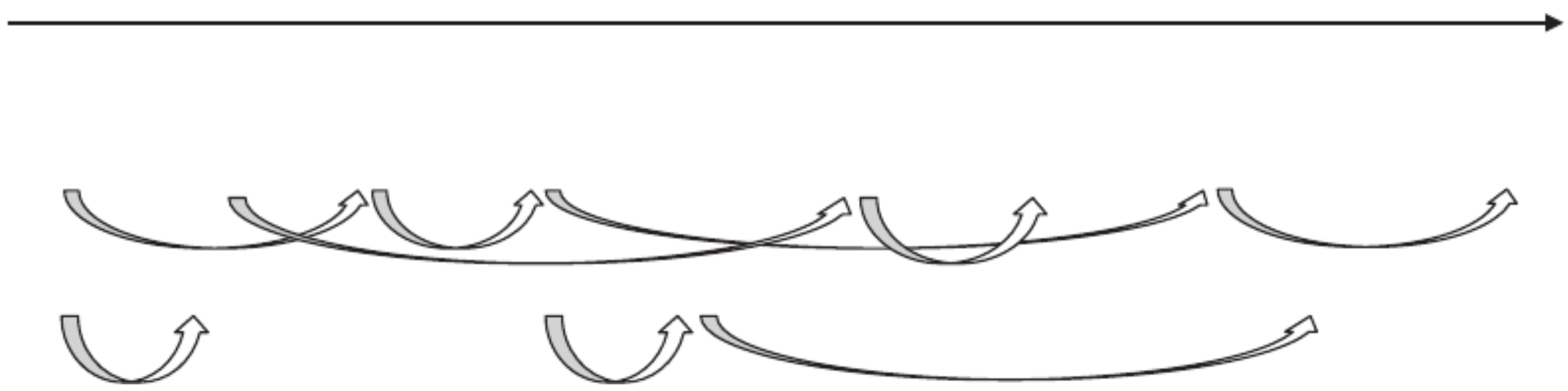

Fig. 1. Managing the resource orchestration process.

as a leader in terms of both market share and technology leadership.

5. Discussion

Our analysis of Metso Paper's successful development of a new technology to reestablish evolutionary fitness (Helfat et al., 2007) makes it possible to specify what is arguably the core in dynamic capabilities theory: how orchestration processes produce a timely and appropriate organizational response to environmental dynamism. The findings demonstrate in depth how a dynamic capabilities response to market transformation evolves in an orchestration process involving the four asset orchestration modes of accessing, integrating, developing, and releasing and how these are stretched out in organizational time and space. When regarded as a process, the combination of different modes reveals patterns regarding how adjustments of interdependent assets relate to each other and how they are balanced and sequenced. By revealing what managerial functions were involved in each orchestration mode, the case also makes it possible to distinguish important differences in the managerial coordination of the interdependencies of the orchestration process. These findings are illustrated in Fig. 1.

5.1. Sequencing and balancing assets in asset orchestration

The role of managers, individually and collectively, is recognized in dynamic capabilities research (Helfat & Peteraf, 2015; Teece, 2012), and our findings explicate managerial considerations in relation to the orchestration process. Our data provide important information about how the orchestration modes are managed over time. Thus, not only do the data highlight that orchestration can fruitfully be understood as processes involving analytically separate orchestration modes, but they also show the importance of considering asset interdependencies (Sirmon et al., 2011) or cospecialization (Teece, 2007), and they do so in two ways.

With regard to intra-mode codependence—combining the *same* orchestration mode— the data point to managers applying what we call *sequencing*. For instance, rather than accessing all project assets at once, these were accessed incrementally over several distinct asset orchestration efforts. Sequencing asset orchestration within the same mode allowed time for each orchestration to take effect before pursuing the next, echoing research on how contextual limitations, financial commitments, and technological risk are managed in product development (Krishnan & Ulrich, 2001). Also integration orchestration modes were sequenced. The initial integration involved taking stock of the existing solutions and thus required an initial integration over time (Helfat & Raubitschek, 2000; Kotha, Zheng, & George, 2011) associated with the organizational skills of integrating, retaining, and using old knowledge (Marsh & Stock, 2006). Subsequently, integration aimed at integrating internal and external assets accessed later in the orchestration process, thus ensuring a coordinated organizational response to environmental dynamism.

The orchestration process pattern shows that inter-mode codependence was handled by managers combining *different* orchestration modes to partly offset the opposite effects from prior and subsequent orchestration, applying what we call *balancing*. Each mode tied in with the mode preceding and following to allow the project to be tailored to e.g. technological progress, budget constraints, and competitive forces. For example, integration was necessary both initially, to take stock of current knowledge assets, and later, as additional assets had been added, reflecting prior research on how capabilities can integrate assets (Prieto et al., 2009). Arguably even clearer, the releasing assets in the form of the second, unused pilot plant was an expressed concession to budget constraints following investment (accessing) in upgrading the active plant representing balancing of two different orchestration modes. Also the news about a competitor's product development meant focusing development by releasing; concretely disposing and cannibalizing other technologies (Danneels, 2008) in favor of developing other assets, illustrating the orchestration process in relation to external events (Moliterno & Wiersema, 2007). Together, this illustrates asset orchestration in the interaction of technology, production volume, and industry demands (Macher & Mowery, 2009).

Taken together, the orchestration mode framework together with the concepts of sequencing and balancing add specificity regarding the orchestration processes emphasized in earlier research (Helfat & Raubitschek, 2000; Teece, 2007). Importantly, this finding highlights a boundary condition for firm flexibility. Orchestration sequencing and balancing appear to be related to and inherently constrained by the fundamental challenge of asset shortage, particularly regarding critical assets (Katila & Shane, 2005; Sirmon et al., 2011). Asset scarcity forces management to delay a certain orchestration or to involve a more time-consuming sequencing and/or balancing (discussed more below). Consequently, our findings explicate the importance of the management of interdependent assets as mediating the impact of organizational asset scarcity. In turn, the ability to sequence and balance orchestration modes emerges as an explanation for insufficient firm flexibility and inadequate responsiveness to environmental dynamism (cf. Bradley, Shepherd, & Wiklund, 2011).

5.2. Managing asset interdependencies

In our case, each effort to adjust assets in the orchestration process constituted an intentional managerial decision (Teece, 2012) and punctuated the starting point of collective action (Foss et al., 2012). As such, distinct asset adjustments offered a distinguishable scope and feedback opportunity, monitored closely by managers to evaluate the progress of orchestration. The data show how attending to deviations as well as financial and other constraints made it possible to sequence and balance asset adjustment to increase overall goal achievement during development. For example, accessing assets that led to a more flexible pilot plant was scrutinized at all levels: within the project, at Metso Paper locally, and at the corporate level. Thus, the process of monitoring the effects of each asset adjustment suggests a new understanding of the role of managers in asset orchestration.

Although dynamic capabilities research highlights the role of managers (Helfat & Peteraf, 2015; Salvato, 2009; Teece, 2012, 2014), the asset orchestration concept has remained vague regarding the role of managerial hierarchies (Helfat et al., 2007). As shown in Fig. 1, our data demonstrate how asset orchestration was contingent on the decisions by managers at various levels and functions in the organizational hierarchy, revealing patterns that, to date, are given limited attention in dynamic capabilities research.

Specifically, the orchestration modes were related to the hierarchical position. Almost exclusively, R&D managers and senior engineers having the main responsibilities inside the project initiated the integrating and developing of firm assets. This contrasts with accessing and releasing, which involved financial and other substantial consequences. Accessing and releasing were initiated from outside of the project by managers at the level of the managing director or business unit manager or even referred upward to corporate decision-makers. The exception concerns the project development decisions made by the division manager, which led to a substantial reallocation of the research focus. Naturally subject to how, e.g., idiosyncratic organizational factors affect decision-making (e.g., Dixon, Meyer, & Day, 2010), this pattern substantiates the findings that larger asset commitments depend on decisions from higher echelons (Floyd & Lane, 2000), typically associated with decision rights for financial decision-making (Pandza, 2011).

This sheds light on how dynamic capabilities allow firms to produce a timely response to environmental shifts. Specifically, this nuances the influence of managerial agency in dynamic capabilities theory (Teece, 2014), in two ways. The success of the NTT project means that it overcame a number of challenges associated with *vertical* coordination between the project and senior manager levels. For instance, even if dynamic capabilities operate on both the individual and organizational levels (Rothaermel & Hess, 2007), the quality of information typically deteriorates when transferred between hierarchical layers (Teece, 2007; Teece et al., 1997). Further, centralized decision-making at a high hierarchical level delays the organizational response (e.g., Volberda, 1997) compared to flatter organizations (Galunic & Eisenhardt, 2001; Webb & Pettigrew, 1999). Its success means that such challenges were sufficiently overcome in the NTT project, which suggests managing vertical coordination, across hierarchical levels, as being key for successful asset orchestration (cf. Floyd & Lane, 2000). In particular, by showing the interaction between hierarchical levels in asset orchestration, our findings complement the top-down implementation suggested by Chadwick et al. (2015).

Establishing that the quality of asset management is central to explaining firm outcomes, *horizontal* managerial coordination also appears to be central in explaining the appropriateness of organizational responses. Research shows that, on the one hand, the appropriate firm response to dynamic environments depends on managers with complementary foci and areas of attention (Pandza & Thorpe, 2009). The involvement, for instance, of expertise in customers, found to ensure successful product development (Danneels, 2002), appeared in the case data in which complementary competences were integrated by actively involving managers from marketing and sales into product development. On the other hand, the research shows that if they are not sufficiently considered, diverging preferences among managers can distort the adaptation, threatening the appropriateness of an organizational response (Zahra et al., 2006). Managers from various parts of an organization can have disparate mental schemata that unconsciously color actions during organizational change (Narayanan, Colwell, & Douglas, 2009). Different performance measurements (Prieto et al., 2009) and diverging interests (Pandza, 2011) lead to the intentional withholding or distorting of information by managers and sub-optimization and inadequate organizational responses (Pettigrew & Whipp, 1991). The success of our case project proves that an organizational ability to coordinate different firm functions horizontally is key to producing an appropriate response to environmental dynamism. Taken together, vertical and horizontal hierarchical managerial coordination stands out as being central to ensuring a timely and appropriate response to environmental dynamism. Thus, horizontal and managerial hierarchical coordination addresses the influence of managers in dynamic capabilities theory (Teece, 2014) by specifying what managers are involved in and in what ways.

6. Conclusion

Dynamic capabilities research focuses on the ability of firms to respond to external dynamism by orchestrating assets, particularly in product development. Our in-depth study of a case of a successful response sheds much-needed light on the orchestration process, recognized as "the core of dynamic capabilities" (Teece, 2014, p. 333) that is key to reestablishing evolutionary fitness (Helfat et al., 2007). In doing so, this study contributes in three main ways to the literature on dynamic capabilities.

We first develop a generic asset-level framework of four conceptually distinct orchestration modes for analyzing how dynamic capabilities operate on assets during orchestration processes. Dynamic capabilities theory at large is plagued by an often confusing terminology, and explicit calls are made for more conceptual clarity regarding asset orchestration (Mulders & Romme, 2009). Building on and extending prior theory (Danneels, 2011), our framework contributes to increased precision in dynamic capabilities in general, and to theorizing how dynamic capabilities operate on firm assets in particular.

Second, dynamic capabilities theory has largely remained underdeveloped with regard to the processes by which assets are orchestrated (Sirmon et al., 2011; Teece, 2007, 2017) and our study answers to calls for more attention to how asset orchestration plays out in time (Leiblein, 2011). It shows the temporal managerial coordination of interdependent orchestration modes. Specifically, explicating asset orchestration as a process, we have proposed sequencing and balancing as central in the managerial coordination and thus important for theorizing the processes in which dynamic capabilities re-establish evolutionary fitness.

Third, our study also contributes to an identified need in dynamic capabilities theory to explain how "organizational structures, and decision-making practices associated with the rate at which firms are able to renew, retrench, or retire resources" (Leiblein, 2011, p. 924). It extends the recognition that managers play important roles in dynamic capabilities (Teece, 2012) by explicating how vertical and horizontal managerial hierarchical coordination plays crucial roles contributing to timely and appropriate responses to environmental dynamism. Specifically, by pointing to the more specific, active roles of middle and lower managers we complement a general view assuming that managers are implementing higher management orchestration directions (Chadwick et al., 2015). Thus, we directly answer calls from Sirmon et al. (2011) for better theory on dynamic capabilities in terms of asset breadth and depth and, specifically, for detailed accounts of how asset orchestration operates in the multi-level, hierarchical, and lateral scopes of organizations.

These theoretical contributions should be regarded in light of the limitations of the study. We prioritized in-depth data to facilitate analysis of the parts of organizational adaptation to environmental change, thus meeting the need for insights into the "discrete processes inside firms that can be unambiguously causally linked to asset creation"

(Ambrosini et al., 2009, p. 44). However, the use, composition, and timing of the four orchestration modes in more general terms remain to be clarified and validated. As Sirmon et al. (2011) argue, the context of dynamic capabilities differs depending on the maturity of industries. Although we demonstrate how asset orchestration produced innovation in response to environmental dynamism, a boundary condition of the theoretical contributions is that the product primarily rested on existing technology.

This study has implications for practitioners experiencing environmental dynamism. Based on our framework, managers can plan interventions at the asset level to increase evolutionary fitness. Ensuring a timely and appropriate response to perceived external dynamism can benefit from preparing horizontal and vertical managerial communication that allows asset orchestration to be balanced, sequenced, and coordinated. In particular, our findings suggest that a culture allowing easy communication and an openness to sharing or lending assets between functions and hierarchical layers may be important for successful asset orchestration processes.

Dynamic capabilities theorists suggest that adaptation to environmental dynamism depends on the ability to adapt firm assets (Teece, 2007), but this crucial adaptation has remained insufficiently clarified, exemplifying the abstractness often attributed to dynamic capabilities (Danneels, 2011; Zahra et al., 2006). Our process understanding of asset orchestration based on a case of a successful response to a period of market transformation shows how concrete asset orchestration is coordinated in organizational time and space. This study thus begins to theorize what arguably is the central aspect of dynamic capabilities theory: how firm assets are orchestrated in a product development response to environmental dynamism.

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