Journal of Business Venturing 36 (2021) 106126

Contents lists available at ScienceDirect

Journal of Business Venturing

journal homepage: www.elsevier.com/locate/jbusvent

Pivoting or persevering with venture ideas: Recalibrating temporal commitments☆

Hans Berends [a,*], Elco van Burg [a], Raghu Garud [b]

[a] School of Business & Economics, Vrije Universiteit Amsterdam, the Netherlands
[b] Smeal College of Business, Pennsylvania State University, USA

ARTICLE INFO

Keywords:
Entrepreneurship
Perseverance
Pivoting
Process
Time

ABSTRACT

We examine how entrepreneurs rework the temporal commitments implicated in their venture ideas when they persevere or pivot upon confronting unexpected events. To gain a deeper understanding of how entrepreneurs recalibrate temporal positioning, length, and ordering of actions and milestones, we systematically analyzed 22 episodes across five ventures when entrepreneurs had to decide whether to persevere or to pivot. To persevere, entrepreneurs positioned their actions as a continuation of the past, while increasing the temporal length and complexity of temporal ordering, thereby avoiding disruptive changes to their relational commitments. In contrast, entrepreneurs repositioned their actions on a revised timeline in order to pivot. We conclude the paper by discussing the implications of our findings for theory on entrepreneurial action.

Executive summary

Given the uncertainties surrounding entrepreneurship, entrepreneurs are likely to confront unexpected events when they pursue their venture ideas. Upon encountering such events, entrepreneurs may decide to persevere with their original ideas to maintain legitimacy in the eyes of stakeholders. Alternatively, they may pivot to deal with the unfolding contexts they are confronted with. Overall, entrepreneurs face tensions between continuity and change, which they must address.

Prior studies on pivoting and perseverance have focused on the *relational commitments* that entrepreneurs make when they propose and enact their venture ideas. These include commitments entrepreneurs make to stakeholders, and the identities they forge. In addition, there are *temporal commitments*—the envisioned timing of actions and milestones. Because temporal commitments are connected with relational commitments, entrepreneurs must address both when they confront unexpected events.

In this regard, we explore entrepreneurial action *in progress* to complement extant research on time-calibration during the early stages of a venture (Wood et al., 2021). We argue that entrepreneurs are likely to encounter unexpected events that trigger assessments about whether to *persevere* or *pivot*. Either approach requires a recalibration of the temporal commitments — the timing and the ordering of venture actions and milestones — that entrepreneurs have made. Understanding such recalibration is important, as it influences how entrepreneurs will act when they encounter unexpected events.

Accordingly, our research question is: *How do entrepreneurs deal with their temporal commitments when they pivot or persevere in*

☆ This study was partially funded by Innovation Lab, Eindhoven University of Technology.
* Corresponding author.
E-mail address: j.j.berends@vu.nl (H. Berends).

https://doi.org/10.1016/j.jbusvent.2021.106126
Received 10 October 2019; Received in revised form 22 March 2021; Accepted 26 March 2021
Available online 8 May 2021

response to unexpected events? To address this question, we analyzed 22 episodes, across five separate ventures, when entrepreneurs had to decide whether to persevere or pivot in the face of unexpected events (such as problems in their development process, or new possibilities for expansion). Our investigation of these episodes was informed by Wood et al.'s (2021) analysis of the temporal aspects of venture ideas, in particular *temporal positioning*, *temporal length*, and *temporal ordering*.

Our findings show how entrepreneurs recalibrated the existing temporal *and* relational commitments they had made to accommodate the problems and possibilities they encountered. To *persevere*, they adjusted the temporal commitments to position their actions as a continuation of the past. Such positioning allowed the entrepreneurs to maintain their earlier commitments by extending the temporal length of their actions and milestones, while complexifying the action sequences they envisioned. To *pivot*, the entrepreneurs repositioned their actions on a revised timeline by reinterpreting commitments from the past to align with the present and a new projected future. The temporal length of actions and milestones decreased, while the temporal ordering was made contingent upon new outcomes.

This study offers a deeper explanation of how entrepreneurs persevere or pivot when faced with unexpected events. By shifting from the initiation of entrepreneurial action to entrepreneurial action in-progress, we elaborate theory of entrepreneurial action as it relates to time. The findings make clear that considerations of temporal commitments play an important role in entrepreneurs' decisions regarding what they do when they encounter unexpected events. We propose that temporal commitments must be approached in tandem with relational commitments. Only by combining the two can entrepreneurs decide whether to persevere with their original strategies or pivot towards unforeseen potential.

1. Introduction

Because entrepreneurship is a process characterized by uncertainty (McMullen and Dimov, 2013; Chiles et al., 2017), entrepreneurs are likely to confront unexpected events that require them to decide whether to persevere with their original ideas or to pivot from them (Kirtley and O'Mahony, 2020). Prior research on the topic has focused on *relational commitments* including entrepreneurs' commitments to their own ideas and identities (Crilly, 2018; Grimes, 2018; McMullen, 2017; Zuzul and Tripsas, 2020) and to other venture stakeholders (Grimes et al., 2019; Hampel et al., 2020; McDonald and Gao, 2019). Although entrepreneurs may consider pivoting away from their original ideas when their ventures encounter unexpected events, the relational commitments they have made to stakeholders and the identities they have forged may encourage perseverance (Garud et al., 2014b). Thus, entrepreneurs confront a tension between the need to pivot from or persevere with their original venture ideas.

Although scholars have made progress on the relational front with regard to this tension, little insight on the temporal front is available in the literature (Lévesque and Stephan, 2020). Accordingly, we focus on how entrepreneurs deal with *temporal commitments* — the timeline envisioned for the venture, and the timing of key actions and milestones — when they confront unexpected events. These temporal commitments are connected with relational commitments (Garud et al., 2014b; Lounsbury and Glynn, 2001). For instance, stakeholders give their support to a venture based on entrepreneurs' narratives on the development of the venture, including the milestones they will reach within a particular time horizon. Such temporal commitments are frequently disturbed during the entrepreneurial process, such as when developmental delays occur. Temporal adjustments may influence these relational commitments, and, consequently, the perceived viability of the opportunity pursued in the eyes of their key stakeholders, and any eventual decisions they make to stay on board (Snihur et al., 2017; Wood and McKinley, 2017). Therefore, it is important to consider the temporal *and* relational commitments at stake for entrepreneurs and their ventures when unexpected events arise.

Towards this end, we extend research on time and entrepreneurial action offered by Wood et al. (2021) who argued that entrepreneurs' initial action depends on "time calibrated" narratives. Time calibration adjusts the temporal commitments of a venture idea to align with its content and relational commitments. Wood et al. (2021) drew attention to time calibration for the *initiation* of entrepreneurial action during the early stages of a venture. Building on this work, we explore entrepreneurial action *in progress* when entrepreneurs encounter unexpected events that require them to either *persevere with* or *pivot from* their venture ideas.

We followed a theory elaboration approach (Fisher and Aguinis, 2017) to identify how entrepreneurs deal with temporal commitments beyond a venture's initiation. In particular, we address the following question: *How do entrepreneurs deal with their temporal commitments when they pivot or persevere in response to unexpected events?* To address this question, we examined 22 episodes across five different ventures in which entrepreneurs encountered unexpected events that positively or negatively impacted their venture ideas.

Our findings show entrepreneurs recalibrating the temporal commitments associated with their ideas *in combination with* the relational commitments to deal with problems as well as new possibilities. To persevere, they adjusted the temporal commitments to ensure that their actions were positioned as a continuation of the past. Such positioning made it possible for the entrepreneurs to maintain their earlier relational commitments by extending the temporal length of their actions and milestones while complexifying the action sequences envisioned. Thus, by changing temporal commitments, entrepreneurs were able to persevere and avoid disruptive changes to their relational commitments.

To pivot, entrepreneurs repositioned their actions on a revised timeline by reinterpreting the past to align with a new projected future. Specifically, entrepreneurs decreased the temporal length of actions and milestones envisioned, and temporal ordering was made contingent upon new outcomes. Here, the shift in temporal commitments facilitated change in relational commitments to accomplish pivoting.

This study offers a deeper explanation of how entrepreneurs persevere or pivot. By shifting from the initiation of entrepreneurial action to entrepreneurial action in-progress, we elaborate theory on entrepreneurial action as it relates to time. Temporal issues including timing and milestones become commitments which entrepreneurs must address when they encounter unexpected events. They do so by evoking and modifying the past and the future in the present to reconstitute or reinforce their venture ideas. Thus, we highlight the importance of considering temporal commitments in tandem with relational commitments to understand entrepreneurship as process.

2. Venture ideas, pivoting, and perseverance

Entrepreneurs generate ideas for new products and services and pursue some they perceive as opportunities (McMullen and Shepherd, 2006). However, there are uncertainties involved, as entrepreneurial opportunities cannot be fully known *ex ante* (Ramoglou and Tsang, 2016). Indeed, over the course of an entrepreneurial endeavor, entrepreneurs will encounter problems and new possibilities (Kirtley and O'Mahony, 2020) that change their visions and beliefs about the opportunities they pursue (Ramoglou and Tsang, 2017).

Here, we follow an "actualization" perspective within the entrepreneurial opportunity discourse wherein entrepreneurial opportunities are defined as "the propensity of market demand to be actualized into profits through the introduction of novel products or services" (Ramoglou and Tsang, 2016: 411). The actualization perspective overcomes the opposition between the discovery and creation perspectives on entrepreneurial opportunities (Alvarez and Barney, 2007; Wood and McKinley, 2020), as it conceives opportunities as independent of entrepreneurs (as in the "discovery" perspective) to be actualized by entrepreneurs (as in the "creation" perspective). Such entrepreneurial efforts are akin to a gardener watering soil to actualize the propensity of seeds to grow into plants (Ramoglou and Tsang, 2016).

Entrepreneurial ideas, accordingly, involve imagination and beliefs about opportunities before they are actualized (Ramoglou and Tsang, 2016). In this regard, a venture idea is "an *imagined future venture*; i.e., an imaginary combination of product/service offering, markets, and means of bringing the offering into existence" (Davidsson, 2015, p. 683). Rudimentary at first, these ideas are progressively refined by entrepreneurs in interaction with stakeholders' inputs, and as they update their beliefs on the feasibility of their original ideas over time (Shepherd et al., 2012; McMullen and Dimov, 2013).

Venture ideas may have to be reworked in the face of unexpected events, such as when critical feedback emerges (Grimes, 2018), or as new information on *problems* or *possibilities* arises (Kirtley and O'Mahony, 2020). Given the inherent uncertainty of the process (McMullen and Shepherd, 2006), it is likely that entrepreneurs will encounter events that have a positive or negative impact on their ventures in progress (Andries and Debackere, 2006; Reymen et al., 2015): technologies can prove ineffective or present new possibilities, customers may not appreciate offerings and might suggest alternatives, collaborators may not live up to expectations or might ask entrepreneurs to pursue new directions, and competitors and external disruptions can change the landscape altogether (see e.g., Van de Ven et al., 1999; Younger and Fisher, 2020).

Such events may affect entrepreneurs' ideas and beliefs (Shepherd et al., 2012; Kirtley and O'Mahony, 2020) who must persevere with or pivot from their original venture ideas (Crilly, 2018; Ries, 2011; Wood et al., 2019). Basing his concept on the act of pivoting in basketball — keeping one foot on the ground and moving the other foot — Ries (2011) posited that entrepreneurial pivoting involves keeping "one foot rooted in what we've learned so far, while making a fundamental change in strategy in order to seek greater validated learning" (p. 154). Thus, pivoting involves both continuity and change.

Prior studies have identified pivots with regard to ideas (e.g., Grimes, 2018) and strategy in general (Kirtley and O'Mahony, 2020), or more specifically with regard to products, technologies, customers or partners (e.g., McDonald and Gao, 2019; Hampel et al., 2020). Building on these prior works, we define a pivot as a major change in a venture idea, involving changes in technologies, offerings or relationships with customers and partners, such that some of these elements remain whereas others are discontinued or replaced. In contrast, we define perseverance as reinforcement of the entrepreneur's venture idea through the maintenance and extension of their earlier choices of technologies, offerings, customers and partners. Either way — persevere or pivot — entrepreneurs must reconsider the relational and temporal commitments associated with their venture. To appreciate the issues involved, we first discuss the relational commitments associated with venture ideas before turning to the temporal commitments.

2.1. Relational commitments associated with venture ideas

Researchers have drawn attention to the relational commitments that entrepreneurs make to stakeholders such as partners, investors, and customers (Garud et al., 2014a; Lounsbury and Glynn, 2001). Studies have shown that entrepreneurs' self-identity and personal experiences are closely linked with the beliefs they have about opportunities (e.g., Mitchell and Shepherd, 2010; Wood et al., 2014). Entrepreneurs who identify strongly with their ventures ideas and feel a strong sense of psychological ownership are more likely to persevere with their ideas rather than pivot when they encounter unexpected events (Grimes, 2018). In addition, entrepreneurs confront pressure to persevere with their ventures from stakeholders (Manning and Bejarano, 2016). Since entrepreneurs want to maintain legitimacy in the eyes of their stakeholders (Wood and McKinley, 2017; Garud et al., 2014b), their options to revise ideas are constrained. Thus, relational commitments, as they mount, could lead to a "fixation" — an attachment to ideas and identities, which

reduces the flexibility required to pivot (Crilly, 2018).

Despite the pressure on them to persevere, entrepreneurs may have good reason to pivot when they encounter unexpected events. Recent studies offer insight into how entrepreneurs deal with their initial ideas and identities, and how they manage relationships with existing stakeholders while pivoting. For instance, Grimes (2018) and Zuzul and Tripsas (2020) studied how entrepreneurs defended, repaired or reengineered their initial ideas when pivoting, or reinforced their initial venture ideas while staying true to their self-identity. Focusing on important stakeholders, Hampel et al. (2020) explained how entrepreneurs must ensure the sustained identification of their ventures with their user community while pivoting. Relatedly, Grimes et al. (2019) theorized how pivots could be perceived as the onset of mission drift by stakeholders, and how entrepreneurs could mitigate such attributions by engaging in performative impression management and governance practices. Finally, Kirtley and O'Mahony (2020) showed how pivoting is not a single, sweeping move, but rather the end of a process of strategic recalibrations triggered by challenges and new possibilities.

Entrepreneurs' relational commitments to stakeholders and identities, however, are also time-bound, creating temporal commitments. For instance, investors may expect returns on their investments at certain milestones; entrepreneurs' own commitments are based on their emerging and evolving visions of the future (Farmer et al., 2011); regulatory issues may place temporal pressures on a venture (Garud et al., 2020); and resources that have been committed may allow only a certain time horizon for the completion of activities (Snihur et al., 2017; Wood et al., 2019). Thus, relational commitments are interdependent with temporal commitments. Moreover, given that entrepreneurial activities often take longer or play out differently than anticipated (Alvarez et al., 2015), challenges to temporal commitments may trigger the decision to persevere or pivot. Therefore, we examine temporal commitments as intertwined with relational commitments to gain a more complete understanding of the issues involved when entrepreneurs encounter unexpected events.

2.2. Temporal commitments of venture ideas

Time lies at the heart of entrepreneurship (Bird and West III, 1998; Wadhwani et al., 2020). In this regard, Wood et al. (2021) argued that the likelihood that entrepreneurs will initiate action is influenced by their time-calibrated narratives. These narratives include projections of when, for how long, and in what order entrepreneurial actions may unfold. To get started, these temporal aspects

Table 1
Venture descriptions.

Digital sports	Starting as a one-off project in November 2009, a pacing system is developed for swimmers based on moving LED lights on the floor of a swimming pool. After enthusiastic responses, John, a novice entrepreneur, and the directors of MegaTech want to create a spin-off company out of it: Digital Sports. Several other swimming coaches show interest in the LED-pacer. In the meantime, a running track version of the pacing system is sold and developed. Further, ideas for several other products are conceived and explored. Among the multiplicity of initiatives at various stages of development, Digital Sports focuses on data interpretation in digital products as main focus. Because selling the pacing systems and developing the other projects takes much longer than expected, John decides early 2012 to seek an investor partner with experience in sports markets, and aim for products beyond the niche of high-performance sports.
Precision	During his dissertation work, Evert, a PhD student invents a new precision measurement tool and invites Eric, a Master's student, to join in founding a company to exploit the tool. In 2007, the firm is established, and they target OEMs that need precision measurement. Although initially promising, their expectations of large-scale customer acquisition do not come true and they postpone the further development of the company. When in 2008 the financial crisis hits, they decide to develop separately—using a different company name—their own measurement machine, even though this brings them in direct competition with their key clients. However, as soon as the machine is ready in 2012, the industry is back again and sales of their initial product increase. This triggers them to create a meta-narrative in which their 'stand-alone' machine is viewed a component that can be sold to their existing customers as well.
MediCorp	In 2005, a chemistry professor runs into one of his fellow graduate students, Dan, and the professor tells about the medical technology he invented. Dan wants—after three years in a multinational—to start his own company to exploit this technology. They launch a company, acquire subsidies, and start to develop the medical device. Yet, as the way to market is long, Dan spots in 2005 another technology, dealing with water treatment, from the same research group at the university. He creates a separate venture to develop Watertreatment and to create a new consortium around the technology. Yet, again he is disappointed by the lack of progress and when he is approached by some medical specialists to develop a new breathing technology, he incorporates Breathing, which eventually becomes Dan's first product that reaches the market in 2008. In the meantime, the other technologies are further developed, refined and sometimes drastically redesigned, or put on the backburner. In 2012, Watertreatment seems ready for market launch, while for the breathing technology after being successful in Europe, market entry in the US is examined.
Security	In 2005, three students, Nick, Rick and Theo form a team to explore starting a new venture, as part of their Master's program. They are introduced to a university inventor, who has developed technology to print complex security labels, with potential to differentiate for instance between real and fake banknotes. They start exploring the technology, file patents, deliver a first prototype, win several prizes, and acquire subsidies. In 2007, they acquire staged venture capital of in total 1 million EUR to develop their printing machine. Technical difficulties delay development, but eventually in 2009 the products can be delivered. However, they experience major difficulties in selling their products to their target market, the pharmaceutical industry. As time passes by, the investors do not want to invest in a new round without an external investor and without sales. Lastly, in 2010, they change focus to a 'higher' market segment, the banknote-industry. They eventually get a contract, but too late. Because of cash flow problems, they file for bankruptcy in 2011.
Molding	Sander, a PhD student, invents an engineering principle for molding and develops it into a machine prototype. When he is about to complete his dissertation in 2007, Sander starts negotiating with the university about the possibilities to use the patent on this invention. However, he does not agree with the university's proposal and way of dealing with the intellectual property and explores developing a separate yet related machine as a work-around strategy. In the meantime, Sander also gets engaged in advisory work for manufacturing companies; this way he funds further development of the machine and alternative machines. About half a year later, he eventually comes to an agreement with the university and starts to further exploit his original machine together with a client and develops derivatives of the machine as well. Selling an entire machine, however, appears to be difficult. In the meantime, he sees interest from the shoe sole industry and starts developing a separate machine, under a separate brand. Going back to the initial machine, he finds a smart way of selling separate components of the machine and then integrating the components later on.

need to be calibrated with the venture idea. Wood et al. (2021) offered three temporal dimensions that impact the likelihood that aspiring entrepreneurs will undertake action: *initialization*, *pace* and *chronology*. They argued that people are more likely to undertake incipient entrepreneurial action to the extent that (a) initialization is more immediate, (b) the pace of activities from initial action to a milestone is higher and (c) the envisioned chronology moves from a simple to a complex set of self-reinforcing actions.

To theorize the temporal calibration of entrepreneurial action beyond initialization when entrepreneurs actualize opportunities, we turn to the underlying operationalization of (a) initialization, (b) pace and (c) chronology with (a) *temporal positioning*, (b) *temporal length*, and (c) *temporal ordering* respectively (Wood et al., 2021: 151 & 161). We use the operationalization of the key dimensions for this study as they fit better when entrepreneurs move beyond the initial action. *Temporal positioning* refers to the mapping of entrepreneurial action to a timeline. For aspiring entrepreneurs, the timing of initial future action is what matters ('initialization'). However, once the entrepreneurial project is underway, what matters is the broader positioning of actions vis-à-vis what came before and will come after. *Temporal length* refers to the time between actions and the desired outcomes. For aspiring entrepreneurs, it is time towards an initial milestone ('pace'). After the initial action, temporal length extends towards other outcomes and milestones that must be taken into consideration. Finally, *temporal ordering* refers to the sequence of actions and outcomes as envisioned by entrepreneurs.

When entrepreneurs actualize their idea for an opportunity, temporal positioning, length, and ordering become commitments. Not only do they have to ensure that they can deliver, but in addition that temporal issues resonate with stakeholders' expectations (Wood et al., 2021). Temporal commitments, though, can be disrupted when, over time, the venture does not work out as planned or new possibilities are pursued; for instance, with less time available, pivoting become more likely (Wood et al., 2019). In the face of problems and new possibilities, these temporal commitments must be recalibrated, which in turn invites entrepreneurs to persevere or pivot.

In this study, we investigate how entrepreneurs deal with their venture's temporal commitments when they pivot or persevere in response to unexpected events. New outcomes and milestones may have to be envisioned with respect to the revised content, and their temporal ordering may have to be revised given what has already transpired.

3. Research methods

We elaborate theory on pivoting and perseverance by building on Wood et al.'s (2021) insights on the temporal dimensions of entrepreneurial action. Using the theory elaboration tactic of "structuring specific relations" (Fisher and Aguinis, 2017: 448), we identify relations between temporal commitments of entrepreneurs, and pivots and perseverance in entrepreneurial action. This approach is warranted given the need to further understand the calibration of the temporal commitments beyond the initiation stage when the circumstances call for perseverance of pivoting.

Table 2
Data sources.

	Interviews	Documents
Digital sports	November 10, 2010	Business plan, promotion videos (2), newspaper articles and other publications (2), tweets (19), website
	December 22, 2010	downloads (7 moments; ranging from October 24, 2010, to April 16, 2013)
Founder: John	January 24, 2011	
	March 22, 2011	
	April 19, 2011	
	May 17, 2011	
	June 28, 2011	
	August 23, 2011	
	November 22, 2011	
	December 13, 2011	
	March 2, 2012	
	April 17, 2012	
	September 12, 2012	
Security	October 24, 2006	Email conversations with university (8), notes of shareholder meetings (3), financial statements (4),
	November 20, 2007	newspaper articles and other publications (31), patents (2).
Founders: Nick, Rick and Theo	January 23, 2009	
	May 15, 2012	
Precision	February 15, 2007	Business plans (6), notes of shareholder meeting, financial statements (8), newspaper articles and other
	October 16, 2007	publications (14), patent.
Founders: Eric, Evert	December 18, 2008	
	May 14, 2012	
Molding	February 19, 2007	Business plans (2), email conversations with university (5), notes of shareholder meetings (3), financial
	October 16, 2007	statements (3), newspaper articles and other publications (13), patent.
Founder: Sander	December 1, 2008	
	May 14, 2012	
MediCorp	April 12, 2006	Email conversations with university (8), notes of shareholder meeting, financial statements (7),
	February 7, 2007	newspaper articles and other publications (35), patents (3).
Founder: Dan	April 3, 2012	

All founder names use pseudonyms.

3.1. Data collection

We selected five ventures with similar backgrounds to compare episodes involving perseverance or pivoting using a replication logic to generate robust findings (Patton, 2002). First, all the firms were technology-based new ventures, which often confront unexpected events that prompt entrepreneurs to reflect on their undertaking (Andries and Debackere, 2006; Van de Ven et al., 1999). Consequently, these cases were well suited to investigate how entrepreneurs persevere or pivot. Second, all the cases were spin-offs (from a university or a corporation). As a result, these firms had access to technological resources around which they developed innovative offerings (Steffensen et al., 2000). Third, the ventures confronted comparable contexts as we selected ventures from the Eindhoven region in the Netherlands, which is one of Europe's fastest growing economic areas and is conducive to technology entrepreneurship (Sternberg, 2014).

We followed these five ventures over several years (their histories are summarized in Table 1). *Precision*, founded in 2007, focused on a precision measurement tool. *MediCorp*, founded in 2005, focused on commercializing a solution for medicine dispersion inside the body. *Security*, founded in 2005, focused on commercializing a technique to print complex security labels, e.g., to differentiate between real and fake banknotes. *Molding*, founded in 2007, focused on a new engineering principle for production equipment. *Digital Sports*, founded in 2009, was a spin-off from an engineering firm for a 'pacing system' for swimming pools to be extended to a whole array of 'intelligent' sports products. By the end of the data collection period in 2012, four of these ventures were still in operation and one had filed for bankruptcy a year earlier.

Table 2 lists all the data sources (28 interviews and 189 documents) for this study. We held initial interviews around the time that the ventures were founded. Over the following years, we held multiple additional interviews to capture entrepreneurship as a process and get insight into critical episodes. During the interviews, we requested the entrepreneurs to brief us on their ventures' activities, the critical events they had encountered, their current engagement, and their plans for the future. This line of questioning made it possible for us to grasp what had transpired between the interviews, the changes that the entrepreneurs had undertaken to their venture ideas, and the temporal and relational commitments involved. As the ventures progressed, we requested the entrepreneurs to share with us any developments with respect to the specific issues they had mentioned on prior occasions, and any new issues. Conducting interviews with the same people at multiple points in time made it possible for us to gain an understanding of how entrepreneurial action unfolded over time. The interviews lasted an hour on average, were recorded and transcribed verbatim.

The 189 documents include sources such as business plans, personal notes, website pages, tweets, and newspaper/magazine articles related to the ventures (see Table 2). The data offered background information on the ventures (such as financial statements) and contemporaneous evidence on how the entrepreneurs presented their ideas and adapted them over time. Additionally, we used the data to understand the history of the venture and to triangulate the insights from the interviews to mitigate any retrospective bias (Jick, 1979). In combination, the data sources offered a comprehensive understanding of the venture ideas and the changes to the temporal and relational commitments of those ideas.

3.2. Data analysis

In line with our research question, we followed a temporal bracketing strategy (Langley, 1999) to focus analysis on the critical episodes as embedded units of analysis (see e.g., Lok and De Rond, 2013; Kirtley and O'Mahony, 2020), examining episodes when the entrepreneurs had to persevere or pivot in the face of unexpected events. Each venture encountered numerous episodes of this kind, offering multiple instances for comparison (see Strauss and Corbin, 1998).

We started data analysis by writing a case history for each venture to gain contextual understanding (Langley, 1999). These narratives, which are summarized in Table 1, documented the steps taken by the entrepreneurs in the development of their ventures, the key challenges they confronted, and their responses to them. Based on the interviews that we conducted over time, we described the entrepreneurs' plans, expectations and visions for the future, how they experienced their current situation, and how they recollected and interpreted the past at different points in the venture's history.

Next, we identified the unexpected events that required the entrepreneurs to persevere or pivot, and analyzed the episodes triggered by these events to iteratively develop thematic codes (Miles et al., 2014). Specifically, we compared the episodes to generate the emerging categories related to relevant theory. Members of the research team coded the episodes, each taking a critical role by agreeing with or challenging the interpretations of the others (Evered and Louis, 1981). We continued discussing the interpretations from the analysis until we reached consensus.

3.2.1. Coding unexpected events and defining episodes

For each case, we iteratively developed a list of unexpected events that challenged the entrepreneurs' venture ideas. In line with Morgeson et al. (2015), we selected those events that were unexpected for the entrepreneur, were significant for the development of the venture idea and so required a response from the entrepreneurs. In our assessment, we relied on what the entrepreneurs mentioned about these events.

We applied thematic coding to conceptualize the unfolding dynamics (Miles et al., 2014), starting with capturing first-order observations in our transcripts and documents related to the unexpected events (see Table 3). Several first-order observations pertained to unexpected events that had a negative impact on the venture, such as setbacks in the development of a technology or the lack of sales

for the product being developed. Following Kirtley and O'Mahony (2020), we categorized these first-order observations as *problems*. There were other first-order observations around new possibilities, such as technologies that could add to the idea being developed, and customer suggestions to add other products or services. Whereas Kirtley and O'Mahony (2020) labeled these emergent possibilities as "opportunities", we labeled them as *new possibilities*, to avoid any confusion with the notion of "entrepreneurial opportunities" (Ramoglou and Tsang, 2016: p.422).

Upon encountering these problems and new possibilities, the entrepreneurs had to consider multiple relational and temporal commitments, which led to a pivot or perseverance as outcome. To understand the episode triggered by an unexpected event, we used qualitative data analysis software to organize the parts of our transcripts and documents that pertained to a specific episode (Langley, 1999). As these episodes were embedded in the individual case histories, we analyzed them in ways that accounted for case idiosyncrasies while allowing for comparisons between them across cases. For each venture, we identified between three to six such episodes, each starting with an unexpected event and ending with an action to persevere or pivot. Data on a total of 22 episodes formed the basis for our analysis.

3.2.2. *Coding perseverance and pivoting*

By reading the interview transcripts and documents, we identified first-order observations that indicated perseverance.

Table 3
Grounding of concepts.

First-order observations	Theoretical concepts	Overarching categories
- Relationships with stakeholders such as investors and subsidy providers - Regulatory requirements for the implementation of a venture idea - Informal agreements and contracts with partners - Promises to (potential) clients and expectations raised	Stakeholder commitments	Relational commitments
- Statements about perceived psychological or emotional attachment to a venture idea - Stated (lack) of personal commitment to the content of a venture idea	Identity commitments	
- Statements expressing the temporal distance to the next important milestone(s) - Assessment of the amount of time is needed to complete activities - The length of time that is considered in planning the venture - Postponing activities or planning them at an earlier moment	Temporal length	Temporal commitments
- The temporal sequence of actions and milestones as narrated by the entrepreneur - Planning of actions and dependencies conceived between actions - Indicated (un)certainty about when activities will be undertaken	Temporal ordering	
- Stressing continuity between past, current, and future activities - Positioning of new specific activities as part of an ongoing development - Highlighting differences between the past vis-a-vis current and future activities	Temporal positioning	
- Encountering technological options that could add to the idea being developed. - Getting new ideas for extending the venture's offerings - Customer feedback that exceeds expectations and customer interest in additional or alternative products or services. - Partners bringing additional resources and possibilities	New possibilities	Unexpected events
- Setbacks in developing the technology, requiring more development work. - Lack of positive market response (i.e., sales) for the product that is being developed. - Other product development and marketing issues. - Partners that want to change formal or informal agreements	Problems	
- Continuation with activities but at a later moment than initially conceived - Maintaining focus on products, technologies, partners, and customers - Seeking to avoiding adverse consequences of problems	Deferring	Perseverance
- Adding product and service ideas that are in line with past espoused ideas and initialized actions. - Adding new technologies or expanding the scope of existing technology. - Adding markets related to initial venture ideas.	Expanding	
- Reframing and reincorporating past espoused ideas and actions in light of a novel direction in terms of technology, product, or market. - Presenting the consistency of a (seemingly incoherent) portfolio of products, technologies and clients in a new overarching structure or narrative, such as an "innovation center", "technology provider", or "innovation funnel", indicating new choices	Redefining	Pivot
- Separating current products and customers by creating multiple, separate legal entities, brand names, websites, and/or intellectual property. - Explicitly discontinuing past products, technologies, or customer offerings. - Stating a new direction in terms of technology, product and/or market is very different and largely unrelated to what has been done in the past.	Separating	

Table 4
Episodes of perseverance and pivoting by entrepreneurs.

Episode	Unexpected events	Temporal commitments			Relational commitments	Perseverance or pivot
		Temporal positioning	Temporal length	Temporal ordering		
Perseverance by expanding when dealing with new possibilities						
1 – 2005 Adding Watertreatment (MediCorp)	Dan comes across watertreatment technology and sees possibilities for subsidized development.	Stressing continuation of the past, by adding actions: "The newest branch to the stem of Dan is Watertreatment." (Magazine article, 2009)	Increasing temporal length by stressing that much still has to be done: "We asked a few critical questions. … We now applied for a project on Coldsoft." (Interview, February 2007)	Complexifying temporal ordering: "A multinational is interested in the Watertreatment product. Together we are now setting up a large project for follow-up research." (Magazine article, 2009)	MediCorp does not have investors, which allows for adding relatively unrelated technologies. At the same time, the founder secures supportive industry collaboration for new projects.	Perseverance while expanding to new technologies.
2 – 2007 Adding Breathing product development (MediCorp)	Meeting with inventors of Breathing technology, and seeing the opportunity to add this to the product portfolio. At the same time, disappointing results of the MedicAid technology trigger expanding to other possibilities.	Stressing continuation of the past into the future, while adding activities: "Next to the drug delivery system MediCorp is working on a ventilation device." (Magazine article, 2009)	Increasing temporal length: "… The prototype you develop has to be completely redesigned to be able to mass produce it. Next you have to develop molds, next you have to test produce it, you have to make it ergonomic, et cetera. … that takes a lot of time." (Interview, April 2012)	Complexifying temporal ordering by stressing that progress depends on a couple of activities that have to be performed.	New university partners bring knowledge for a new MediCorp technology; no investors but just subsidies and collaborations in the past.	Perseverance while adding new activities expand to new technologies.
3 – 2007 Adding more, different products (precision)	Invention of new alternatives and difficulties with quickly realizing sufficient sales.	Stressing continuation of the past into the future: "The [Precision 2] is a variant on the [Precision 1], the first sensor introduced by [Precision] in 2006. The first one was designed for bigger surfaces. … The [Precision 2] variant targets miniature objects." (Magazine article, February 2008)	Increasing temporal length: "There is lot of research to be done for new developments to increase the product portfolio, both in S and width. The most vivid example is the Precision 2 … which will be available in the third quarter of 2007" (Industry yearbook, 2007).	Complexifying temporal ordering: "We got a new prototype. That has to be completely developed. … Next to that, we got a variant of the current product. … And the next product is also very nice. That will help also to broaden our nice market." (Interview, October 2007)	Precision does not have investors, which enables expansion without severing relational commitments.	Perseverance: the products are presented as a logical expansion of past activities.
4 – 2007 Adding new elements to the technology (security)	Demands for security labels are more complex than expected, triggering the development of additional security elements.	Stressing continuity, while adding new activities to the timeline: "The story is exactly the same. Just, through these four layers [of security] we have added more functionality. …" (Interview, November 2007)	Increasing temporal length: "So, it is well possible that in a year we have full production." (Magazine article, summer 2007)	Complexifying: "We need to continuously develop new characteristics, in two years we need to introduce new ones." (Interview, November 2007)	Relational commitments to public subsidy providers, which enable adding new options in line with past activities.	Perseverance is enabled through expanding the narrative to incorporate derivatives of the security label they initially developed.
5 – 2008 Adding more markets and applications (molding)	Interest from several widely different markets for Molding's technology, after media coverage, and the founder wants to respond to these potential customers.	Stressing continuity with the past in terms of technology: "Molding looks for an application where the fundamental form of the product is the same, even though the products are not. … There are five different sectors defined for applying the Molding technology. …. Molding realizes that the	Increasing temporal length, Sander explains when he wants to have finished the first product: "Well, within now and one year." (Interview, October 2007) The same expanded timeline is confirmed in the 2008 version of the business plan.	Adding complexity to the temporal ordering: "It goes beyond a prototype. If I really want to get it work, I need to build a new [machine]. (…) Bigger, larger, according to the same idea but with a different [working] principle." (Interview, October 2007)	No investors or any other stakeholder commitments, which gives freedom to add other target markets and applications.	Perseverance: Sander expands his market focus, selling the same technology to different markets: "I have defined a number of markets. …. Next, I can develop applications for these markets, and each of them require a specific machine." (Interview, October 2007)

(*continued on next page*)

Table 4 (*continued*)

Episode	Unexpected events	Temporal commitments			Relational commitments	Perseverance or pivot
		Temporal positioning	Temporal length	Temporal ordering		
		technology can be used for several different applications." (Business plan, 2008)				
6 – 2010 Project to prototype (digital sports)	The pacing system for swimming, initially a contract engineering project, attracted considerable attention from other possible clients: "Pretty soon we saw that there was a lot of market interest … the response from the national coaches was amazing," (Interview, Nov 10, 2010)	Continuation of the past into the future by adding pacing systems. The system that was already installed could be used for testing, development and sales. John explained how he used the system implemented in the past to get swimming coaches present at a tournament interested: "As soon as I saw somebody with a camera I just walked out and said 'well this is our system' so I started to explain what it was" (Interview, Nov 10, 2010)	Increasing temporal length, by envisioning this could become a separate firm, resulting in an extension of the timeline into the future, including plans for sales and further development: "I explicitly waited for contacting them [the coaches] because there is a European championship coming up in two weeks [end of November]. Because, if I contact the coaches, I want to have a proposition." (Interview, Nov 10, 2020)	Complexifying by adding new activities: being present at the upcoming European championship, engaging in sales activities, and organizing production of a second system: "we are setting up a new production run and I hope it will be ready somewhere next January, and then we can install the system, and then we can ask the national team to train with it." (Interview, Nov 10, 2010)	Existing commitments to the initial client – a national swimming center – are maintained and it is agreed to continue to use this center as site of experimentation and reinforcing personal commitment: "It was already sort of my baby (…), that's why I said 'well let's move forward'" (Interview, Nov 10, 2010)	John perseveres by incorporating an expansion to multiple pacing systems into the existing idea, and expands his actions to turn customer interest into sales.
7 – 2011 Adding running version (digital sports) (see also main text)	Positive response to the swimming prototype from the manager of an innovative sports facility with a 400 m track.	Continuation of the past into the future. The running versions builds upon swimming version.	When adding the running version, John extends temporal length further into the future.	More complex temporal ordering: "I am still in doubt whether it will a onetime project or it will be a product." (Interview, Jan 24, 2011)	Commitments are maintained as existing as well as future relational commitments are quite rigid because they are government-subsidy based.	Perseverance, incorporating the expansion into the existing idea.
Perseverance by deferring in response to problems						
8 – 2007 Preparing for animal trials (MediCorp)	Technology needs more development than expected to get to proof of product.	Continuation of the past, but extending on a longer time horizon towards the future. "When I have done these animal trials … my company will be valued higher. … But we can't wait too long. … So in the summer I will talk with investors again." (Interview, February 2007).	Increasing temporal length, by reinterpreting the start as too early: "In hindsight it was too early to start a firm. … In this market one should in fact start a firm when animal studies are done with positive results. … The animal test that we should have done a long time ago will only be done this and next month. In this respect, we started 2.5 years too early. (Interview, February 2007)	Complexifying temporal ordering by adding activities: "When developing the technology, fundamental elements were discovered that were not well understood." (Newspaper article, July 2006)	Public subsidy-partners stress continuation and completion of projects.	Perseverance: the same projects, but postponing the milestones that were projected earlier: "We have a go-no-go decision scheduled in May—that date is fixed—which will be based on: does the prototype do what it has to do? The main short-term goal is to do anyhow a good animal test in June." (April 2006)
9 – 2008 Delayed first contract with launching customer (precision)	First potential launching customer is not interested anymore.	Stressing continuation of past, while deferring: "Well, with this firm, it took quite long. … In the meantime, we had a flirt with another firm. But that eventually was not realized, so we came back to them [the first customer]." (Interview, October 2010)	Increasing temporal length. Initially: "In 2009 we will have realized a turnover of 3,5 million EUR." (Business plan, May 2007) Later: "It took a while, longer than I expected…but eventually we will see it." (Interview, December 2008).	Complexifying temporal ordering: "I feel it is more busy, as many things to which I otherwise would devote quite some time I left aside … I hope growth will pick up a bit, so we get critical mass, so to say. … I expect that this will happen, so we will get more income." (Interview, December 2008).	No investors and no existing customers, only public subsidy partners, which enables adjusting the time line.	Perseverance: the same products but with deferred milestones.

(*continued on next page*)

Table 4 (*continued*)

Episode	Unexpected events	Temporal commitments			Relational commitments	Perseverance or pivot
		Temporal positioning	Temporal length	Temporal ordering		
10 – 2009 Postponing market results (security) (see also main text)	The founders experience a lot of setbacks, both regarding technology and the market.	Stressing continuity with the past in terms of markets, even though market approach is more focused: "With the developed technology the three entrepreneurs would have been able to storm several markets—CD's, DVD's, cosmetics, cigarettes, brand clothing, et cetera—but they selected pharmacy. [Security's founder]: That's a choice, we have to focus." (Magazine article, April 2008)	Increasing temporal length: "Despite the large amount of potential clients, [Nick] experiences difficulties to get a market share. … 'Due to the economic tide, we are still waiting for the realization of the contracts with big firms', [Nick] said." (Newspaper article, November 2009)	Adding complexity: "We are still negotiating with that customer. … We now do talk about prices and amounts, but I do not know when we can deliver, so they strike back. … So it is really hard to commit to new clients. In principle, I don't want to do that, so I try to delay that as far as possible. Till I know if everything is going well." (Interview, November 2007)	Commitments to venture capitalists who want focus leave little room for alternative markets and products: "They said: you need to focus, you need to focus. So that meant that we worked on one concept and developed that to the end product and we focused on that [pharma] market." (Interview, May 2012)	Perseverance while at the same time stressing that technology development and sales efforts require more time.
11 – 2011 Production problem: leakage (digital sports)	Discovery that some modules leak, probably due to chemicals in the water.	Continuation of the past into the future, with some modifications to system. Functionality that is promised remains the same.	Extending temporal length, time to next milestone will be longer. "Originally we planned a couple of milestones. … Well I don't have to explain to you that our business plan has been delayed for like half a year three quarters of a year." (Interview, April 19, 2011)	Adding events, as new actions are to be taken to make the accommodating work: new production run, with new partners, and with a new approach.	Partners are waiting for the technology (in particular the coach of the national team) and need to be assured that they will get to use it.	Perseverance: "[W]e are now just getting at the same point that we were three quarters of a year ago in terms of product validation and market and everything." (Interview, April 19, 2011)
Pivoting when dealing with new possibilities						
12 – 2006 Creating holding structure and overarching vision (MediCorp) (see also main text)	Adding different technologies with different markets require MediCorp to explain the overall fit of the different projects.	Reviving facets of the past to make a pivot towards a firm that contains different technologies. "I have built a firm that goes beyond a single idea. We have developed expertise and want to use this expertise of course, also for different things. So, since the end of 2005, but mainly in 2006, we have set up the [innovation] funnel." (Interview, April 2012)	No explicit change observed in temporal length; temporal length undetermined.	Temporal ordering is made contingent, whereby different ideas and the execution of these ideas depend on different timelines. "Initially, our research focused on pain relief, but competitors entered that market. The same application can be used to treat bacterial infections.. … A big multinational is interested in Watertreatment. Jointly we are setting up a big project for follow-up research'" (Magazine article, 2009)	Different groups of partners for different technologies and markets and no investors but just public subsidies and industrial and university collaborations. These relational commitments allow a pivot but at the same time require idea work to build a coherent image.	Pivot with a focus on different technologies and markets. Understanding the need to provide an overarching narrative to create coherence across the various initiatives across different settings, Dan developed an overarching idea of the firm as an innovation funnel.
13 – 2007 Shifting focus to bone implants (MediCorp)	Disappointing animal trials, market withdrawal of similar product at Johnson and Johnson, and opportunity of an alternative research subsidy threat the business idea.	Stressing change, reviving past facets: "Initially, our research focused on pain relief, but competitors entered that market. The same application can be used to treat bacterial infections." (Magazine article, 2009)	Increasing temporal length: "This program runs till 2013. In the best scenario we will have proven in animal test that we can treat infections" (Magazine article, 2009).	Making temporal ordering contingent: "We made the switch in 2007, but if you change the active ingredient and a couple of criteria, you have to start over with your research. That has also to be	Relational commitments are relaxed. This is enabled by collaborating with new university and industry partners for a new direction, and by not having investors. At the same time, subsidies and	Pivot with a different core product, while other products also continue with a lower pace. Dan now focuses on a different market, with a different application.

(*continued on next page*)

Table 4 (*continued*)

Episode	Unexpected events	Temporal commitments			Relational commitments	Perseverance or pivot
		Temporal positioning	Temporal length	Temporal ordering		
				done very carefully." (Interview, April 2012)	existing collaborations require a coherent story.	
14 – 2008 Collaborating again with the university (molding)	Sander initially devised a work-around strategy to avoid using his university-patented invention, as he was not on speaking terms with the university. Yet, he eventually came to an agreement with the university at the end of 2008 and needs to redefine his firm in relation to the core technology.	Reviving facets of the past into the present. The idea that this entrepreneur initially presented—as a separate technology—was transformed as a derivative 'gadget' based on the original machine to be marketed in the future. "It is a very different story, related to my previous invention but for a different application, more a gadget. It is technically very much related. If the university supports the patent, it gains credibility and reputation. For me as a small firm, a big firm could easily crush me." (Interview, December 2018)	Decreasing temporal length: "Yes, the Dutch patent is granted and next year, January I need to start paying a serious amount to file internationally. … So I worked hard to get enough finances, so this won't be an issue next year." (Interview, December 2008)	Making temporal ordering contingent on which of the at least six (subsidized) options will take off in the future: "I: Things are going well? …R: I have lived from what I earned the year before and from my first client, and the year is almost ended, so that is going well, and now with the [potential] subsidies in addition [it will be all right]…" (Interview, December 2008)	Molding does not have investors, nor clients and partners that press for continuity, enabling pivoting.	Pivot: eventually, the relationship with the university gets better, and Sander reaches an agreement about the 'old' patent. Sander reweaves his narrative by integrating his later separate technology development into his original core invention.
15 – 2011 Data interpretation as core focus (digital sports)	John runs into limits of his attention and resources, triggering search for the common core of several new activities (pacing systems for swimming and running, 'active systems' for trauma recovery, smart sleeves)	Reviving importance of some, but not all facets of the past for the present: "The interpretation of data is also the core for the most of the concepts we have laying on the table now. … The hardware is available or is really easy to make" (Interview, March 22, 2011).	Attention shifts to the present and what the focus on data interpretation would mean for next steps: "For the future of course we want a fairly wide portfolio but in the short term I think it is a change of focus" (Interview, March 22, 2011)	Eliminating actions focused on hardware development and making future actions contingent: ""Maybe somebody will come to us in 2 years and say well you have interesting interpretation algorithms we have an interesting product maybe we can combine the two and we will start a joint venture, it could be." (Interview, March 22, 2011)	The importance of hardware and development partners would grow, so these were willing to take a different role. The lead entrepreneur, John, identified mostly with the idea of an own company, less with its specific focus, offering flexibility as well.	Pivot from the development of hardware products to data interpretation as core competence, leaving hardware development and production to partners, allowing for a more specific competitive focus.
16 – 2012 Redefining as technology provider (precision)	Things are developing well in terms of demand, and all of a sudden their 'old' pre-crisis customers are again willing to buy their key products.	Redefining the past, reconciling relational facets while focusing on the present: "Indeed, we of course have a vision and an overall strategy. I think that is important for ourselves. Yet, how you deviate from that – I have seen that a small change can have a big impact in 5 years on your firm – I don't want to commit to much to [the strategy]. I just say, in fact, is that people still want to measure even smaller things and that we provide solutions for this." (Interview, May 2012)	Decreasing temporal length, with expected sales in the near future, instead of on the longer term as before expressed: "We have a number of real good leads and expect to sell at least a few this year." (Magazine article, 2012)	Making temporal ordering contingent: "We look with opportunities appear and adjust to the circumstances. … We think like: let's finish the machine first. And we will test the waters a bit of course. So that we, as soon as the machine is sufficiently developed, there will be, let's say, one or two who come and say: we want to talk. Then we have a better position to negotiate." (Interview, May 2012)	Due to lack of investors the founders can easily pivot, just having to deal with their (few) clients. "If we would have had an investor – and 2010 and 2011 have just been difficult years – than there would have been a chance that they had said: well, we will stop this." (Interview, May 2012) Yet, they still want to maintain commitments to the few big OEM clients: "There are a few big [machine]builders which together have the largest part	Pivot by redefining the 'separated' machine as a component of their portfolio. "Now, our strategy is that we see this machine also as a component and would prefer to market it through one of our existing clients or leads, these big guys in the market, because we think we could make more profit this way." (Interview, May 2012). A view that was already in the 2011 version of the business plan: "Precision currently

(*continued on next page*)

Table 4 (*continued*)

Episode	Unexpected events	Temporal commitments			Relational commitments	Perseverance or pivot
		Temporal positioning	Temporal length	Temporal ordering		
					of the market." (Magazine article, 2007)	offers several components and engineering services."
Pivoting in response to problems						
17 – 2007 Stopping collaboration with university (molding)	Soon after the start of the company, Sander runs into trouble with the university about using the patent on his invention, and he decides to discontinue formal collaboration with the university.	Sander starts to separate his product from his previous invention by developing a different yet related machine, to work around the existing university-owned patent: "I am now working hard on a new, improved version, which seems well possible. After that, I can file my own patent and then I don't need my old patent anymore. … This is based on a very different principle than the current patent." (Interview, October 2007).	Decreasing temporal length: So, I have basically all ingredients to enter the market with my first machine and generate money even within one year." (Interview, February 2007)	Making temporal ordering contingent on collaboration: "Yesterday I was at a machine factory, who will build a machine. I am not going to do that myself. … He was very much enthused." (Interview, February 2007)	Does not want to collaborate with university anymore and therefore breaks away and avoids support. ""I am planning to register my company without [the university] … I don't know what I am after that going to do with the university. Probably nothing." (Interview, February 2007)	Pivot: As soon as the entrepreneur starts to market his product, he runs into trouble with the university that owns the patent on his invention, and he breaks away from his commitments to this stakeholder. "Another possibility to secure a competitive position is to not use a patent, but to hide part of the business model for third parties." (Business plan, 2008)
18 – 2008 Introducing separate new machine (precision)	Finally, Precision's founders get a sales contract with one of the large OEMs, yet unexpectedly the financial crisis of 2008 hits these companies and sales do not materialize, creating the need to look for other market opportunities.	Separating from the existing product and existing customers: "Then we have in fact a complete machine, and we compete in fact a bit with our own clients. … Despite the fact that you compete with your clients you position yourself as a stepping stone to a bigger machine." (Interview, October 2010) "We deliberately separated this. This is our regular product and the machine is put next to it, different name, different branding. We started the marketing on the internet. At start we did not communicate that we were behind this." (Interview, May 2012)	Decreasing temporal length, emphasizing that one machine is already in fact sold. Also the projections in the business plan show short term results.	Making temporal ordering contingent on the actions to realize the new idea: "[F]or this new machine we aim to cover most of its development this way. … Regarding distribution, initially we will do that ourselves in Europe, but for Asia and America we will search for distributors. … [Production] will be outsourced as much as possible." (Precision, October 2008)	Their market basically exists of a few OEMs that are their main clients or potential clients. To avoid to put their relationship with the OEM at risk, and while they are competing for OEM clients, they physically separate the new product, thus relaxing both relational and identity commitments.	Pivot: Introducing a new machine, separated from other products by creating another venture, brand name and website.
19 – 2010 Focusing on the shoe-market as a target (molding)	Sales in the selected markets are delayed due to the financial crisis, but there is interest from shoe-sole producers for a specialized machine.	Stressing that the market and product are really separate and need to be marketed as a separate firm.	Decreasing temporal length, with expected sales earlier than previously expressed: "With an aggressive Retail Outlet-foot scan coverage plan of 20%, [ShoeShape] aims to acquire 10% of the orthopedic top segment in Sole, Last and FitShoe production in year 1 in The Netherlands, with a	Making temporal ordering contingent on collaboration with others: "We need a strategic partner who is interested in this technology … Then we can help to develop the product line or machine and they can add their knowledge about a particular market and materials et cetera.	No investors and few committed business partners, enabling taking on a focus on a very different market. Company identity is maintained for the original product and market focus, the new business proposition is marketed in a separate company.	Pivot by focusing on an additional and rather different market, namely the shoe-sole market.

(*continued on next page*)

Table 4 (*continued*)

Episode	Unexpected events	Temporal commitments			Relational commitments	Perseverance or pivot
		Temporal positioning	Temporal length	Temporal ordering		
			minor inroad in Germany. This should result in Break Even Point within Year 1 of operations." (Business proposition leaflet, 2010)	… Multiple parties are interested and we are still stalking at this moment. (Interview, May 2012)		
20 – 2010 Radically changing market focus (security)	Facing the scenario of bankruptcy because the investors do not want to invest in the next stage. No sales results in the pharmaceutical industry so far.	Separating from the past: While still using the same technology for producing security labels, they developed authenticity features for banknotes and shifted towards exploring the banknote industry. Deciding to abandon their efforts in the drug market, they instead invested in a segment they had not wanted to focus on earlier. They stressed that the future should be different from the past, and that this new sales strategy could finally be successful.	Decreasing temporal length, with cooperation starting in the near future: "For an introduction in the high end document security industry, Security is starting up co-operations with established players in the security industry, to gain access to the high end market. … Security is also looking into applying its security feature to banknotes and laminates." (Magazine article, June 2010)	Making temporal ordering contingent, as one of the founders reflected: "We told him the story. And then the high security segment started to take off. … We already had a few meetings, and at a certain moment it goes around. … Look, then it is also a bit due to the credibility of the technology [if it takes off]." (Interview, May 2012)	Investors do not want to invest in the next stage; therefore different investors are needed, creating room for a pivot.	Pivot: The founders explicitly separate from the past when they change to the banknote-industry. "The more we focused on the lower segment, the more difficult it was to sell our concept or product. …Eventually, in the final year, we were relatively successful in the high-security market, we actually had a contract with national banks to develop new banknotes." (Interview, May 2012)
21 – 2011 Investor partner and shift to broader sports market (digital sports) (see also main text)	Accumulation of delays. "What I thoroughly underestimated is the time needed between when the coach says 'OK, let's do it', how much time it will take until you will actually have a signed order and a paid invoice. That is sometimes absolutely ridiculous" (April 17, 2012).	Separating from the past, by abandoning the idea to develop the company independently and seek an investor partner experienced in the sports market and redirecting focus to the running version. "We decided to focus on running rather than swimming. It is the biggest market and the translation between the high-performance sports that will always be interesting." (Interview, Dec 13, 2011).	Temporal length of actions considered shifts to the short term; attention redirected to getting an investor on board that could then help to expand the new course of action.	Simplifying ordering, making the future actions contingent on the new, emergent plan: first get an investor on board, then expand again. "So what we are going to do is we are going to make a business plan to look for an investor or maybe a company that suits our vision and the way we approach things" (Interview, Dec 13, 2011)	Several coaches of national swimming teams had expressed interest, but no signed orders were in place yet, leaving flexibility. Beyond the engineering partner, no investor was on board yet.	Digital Sports pivots from a go-it-alone strategy to working with a market partner who can help to shift to larger markets than offered by the niche of high-end swimming centers. "The swimming version is put on the backburner. It's more like a hobby project" (Interview, April 17, 2012).
22 – 2012 Deemphasizing MedicAid (MediCorp)	Other products become more successful, development of MedicAid is taking (too) long.	Stressing that separating from the past trajectory is needed: "While we increasingly face obstacles, that we think …. if we need to do all that, and look how long we are already working on it, that won't succeed anymore." (Interview, February 2012)	Decreasing temporal length: "At the end of this year, when also the [subsidy] money is finished, we have a large go/no-go. And 50–50, it is not sure that we continue. … Well, at the end of this year, we will decide." (Interview, April 2012)	Making temporal ordering contingent on future decisions: "If we then continue, we have to start directly with animal trials. And if we stop, we will really stop, we will drop the entire technology." (Interview, February 2012)	Public subsidy-collaborations are ending (as the subsidy ends), enabling a pivot. No investors involved. Identity is maintained, as the firm had been reframed already as a 'technology funnel'.	Pivot by discontinuing a product-line (which was the original product the firm started with).

Perseverance refers to entrepreneurs reinforcing their venture ideas through the maintenance or extension of technologies, offerings, customers, or partners. We discerned two types of perseverance among these first-order observations: 'deferring' and 'expanding'. Entrepreneurs deferred when they encountered problems, which was captured in first-order observations such as postponing previously agreed to milestones when encountering difficulties in developing technologies or in securing sales contracts. For instance, Medicorp's founder deferred by using arguments about drawbacks and new materials: "*The last two years we just needed quite a lot of additional research, because things just did not work well. And we did not understand why*" (Medicorp, February 2007).

'Expanding' occurred when entrepreneurs encountered new possibilities as captured through first-order observations such as additions to existing products and the extension of technologies into new areas. An example is the expansion of Digital Sports from a 'passive pacer' of target speed to an 'active system' in which professional swimmers as well as patients working on their recovery could interact with sensor data (e.g., heart rate data). In both types of perseverance (i.e., 'deferring' and 'expanding'), the original venture idea was maintained.

As noted before, a pivot is a shift in the venture idea (i.e., changes in technologies, offerings, or relationships with customers and partners) such that some elements remain whereas others are discontinued and replaced. Based on this understanding, we coded first-order observations and noticed that these also came in two types—'redefining' and 'separating'. Redefining maintains some elements while replacing others by re-envisioning the overall idea for the venture. First-order observations for 'redefining' include the reframing of past espoused ideas and actions in the light of a novel direction in terms of a technology, product, or market, and the presentation of a seemingly incoherent portfolio of products, technologies and clients consistently within a new overarching structure or narrative, such as an "innovation center", "technology provider", or "innovation funnel".

Separating means facilitating the continuation of some elements while changing others by breaking up the overall venture idea. First-order observations for 'separating' captured observations in which entrepreneurs stressed discontinuity between the past and the future. For instance, in Molding, Sander decided to discontinue his formal collaboration with the university important to him: "*I am planning to register my company without [the university] … I don't know what I am after that going to do with the university. Probably nothing.*"

3.2.3. Coding temporal and relational commitments

For each episode, we analyzed how temporal commitments were recalibrated. We started with first-order observations such as statements by the entrepreneurs on the time to achieve the next milestone, the uncertainty involved in the next steps, or the need to reinterpret the past. Iterating between these first-order observations and the literature, we found that the distinction between temporal length, temporal ordering, and temporal positioning was helpful in conceptualizing the role of time. Building on Wood et al.'s (2021) analysis of temporal dimensions *before* the start of a venture, we further specified temporal length, ordering and positioning to apply *during* the development of the venture, by identifying associated first-order observations.

Temporal length was coded based on first-order observations such as the espoused time to a certain milestone and the changes made by the entrepreneurs to the planning of actions. For instance, as Medicorp's Dan commented: "*We have a go-no-go decision scheduled in May—that date is fixed—which will be based on: does the prototype do what it has to do? The main short-term goal is to do anyhow a good animal test in June."* (Medicorp, April 2006). Yet, when the specified day in May came and went, he explained that further expansion of the timeline was needed.

We coded temporal ordering based on first-order observations of the espoused sequence of actions and outcomes in relation to the venture idea, dependencies between actions, and uncertainty about sequences. For instance, in Digital Sports the sequence of actions was dependent upon the timelines of its potential customers. As the entrepreneur envisioned selling pacing systems to the training facilities of national swimming teams, he structured the initial marketing activities around the competitive events organized at the swimming center where the prototype was implemented (the Paralympic World Championship and the European Championship were organized that year) so that trainers could see the prototype system in action.

We coded temporal positioning by identifying the way in which individuals positioned activities in relation to the past when narrating their present venture idea and its future realization. For instance, this was observed in comments on how activities were related to ongoing developments that they were part of, or differences between the past and the present or the future.

For relational commitments, we coded statements about the role of investors, customers, regulators, partners, and customers in the direction of the venture. For instance, we coded for stakeholder commitments when investors pushed for a continued focus on the initial technology. Reflections on the role of the entrepreneur's own personal involvement were coded as identity commitments. For instance, the lead entrepreneur for Digital Sports commented on his own involvement in relation to a pivot: "If it wasn't happening for Digital Sports, it wasn't happening for John. Now that is separated".

After coding each episode using this conceptual structure (see Table 3), we compared how temporal commitments were recalibrated when the ideas were reworked, how this differed across pivoting and perseverance, and how this was associated with stakeholder and identity commitments to the venture idea. We present the key insights from this study in the form of a process model.

4. Findings

Of the 22 episodes we identified, 11 were cases of perseverance and 11 of pivoting (see Table 4). In each of these episodes, the entrepreneurs had to respond to the challenges to the venture idea they encountered because of problems or new possibilities with

respect to technologies, offerings, customers, or partners.

We provide an overview of our findings in Fig. 1, which we introduce here as a guide for the remainder of this section (Berends and Deken, 2021). Whether unexpected events (problems or new possibilities) resulted in perseverance or a pivot depended on joint considerations of temporal and relational commitments by entrepreneurs. Perseverance ensued in the face of problems when it was possible to maintain relational commitments by adjusting temporal commitments—extending temporal length, complexifying temporal ordering, and reinforcing positioning as a continuation of the past. Similarly, perseverance was possible when new possibilities around technologies, offerings, customers, or partners could be made to fit in with the existing venture idea by adjusting temporal commitments.

In contrast, the data show entrepreneurs pivoting when problems could not be addressed by adjusting temporal commitments, and when new possibilities did not readily fit in with the existing idea and associated relational commitments. Instead, problems or new possibilities required a change in both the temporal and relational commitments. Specifically, it required the entrepreneurs to create a new timeline for the project while recasting past actions in a new light, making temporal ordering contingent on future developments, and contracting the temporal length of the timeline considered.

We discuss these findings in the following sections. We first describe how entrepreneurs rework temporal and relational commitments to *persevere*, and then turn to the changes in the temporal and relational commitments leading up to a *pivot*.

4.1. Perseverance

An analysis of the episodes shows how entrepreneurs persevere in the face of unexpected events by adapting the temporal commitments associated with their venture ideas while maintaining their relational commitments. Perseverance was achieved when *problems* could be addressed by adapting the positioning, length, and ordering of actions and milestones for the original venture idea. Moreover, when acting on *new possibilities*, entrepreneurs persevered if these possibilities could be made to fit in with the existing idea and relational commitments. To persevere, entrepreneurs positioned themselves on the same timeline (e.g., in relation to the same past events and the same future events), but deferred milestones, increased temporal length, and complexified temporal ordering. We first provide an example of perseverance to deal with new possibilities, and then an example of perseverance to deal with problems. We conclude with a broader discussion of the changes to the temporal commitments for perseverance.

4.1.1. Expanding: perseverance when dealing with new possibilities

An example of perseverance when dealing with *new possibilities* is the extension of Digital Sports' pacing system for swimming in pools to running on athletic tracks (see Table 4, episode 7). Just before the summer of 2010, the entrepreneur had developed a prototype for a LED lighting-based pacing system for the national swimming training center. In August that year, this prototype caught the attention of a manager of an athletics center who indicated that she would be interested in the entrepreneur developing a similar pacing system for a running track for the athletics facilities that she ran. While sparking the entrepreneur's interest, this new idea did not immediately fit into Digital Sports' existing timeline. At the start of the venture, the entrepreneur had set aside a fixed number of hours with the engineers working on the swimming version. Consequently, any additional work on the running track version would not conform with these partner commitments.

Yet, the request by the athletics manager was enticing, so John temporally *positioned* the extension of the pacing system for running as a natural expansion of what he had been working on so far:

> *"We can do that. That is no problem. This is nothing new. The intelligence of the system is in the software so the hardware is the only thing that needs to be developed. … This doesn't require any additional competences compared to the ones we already have at MegaTech. I wouldn't say it would be easy, but I am confident we can do this fairly quick. And we know how we will do it."*
>
> (Interview, March 22, 2011)

As mentioned, John expanded the original idea by relating it with the athletics center as a site for future application, and by linking it to the relational commitments developed in the past. In other words, he persevered with his original idea even while expanding upon it.

To do so, John increased the *temporal length* of the venture idea by incorporating new milestones for the running version: "I would like to sell two systems before we start developing. This will require some major investment in terms of development" (Interview, March 22, 2011). Selling the two versions would provide Digital Sports with sufficient resources to extend the partners' time commitment for development. In turn, this expansion brought additional relational commitments with temporal implications, as the manager of the athletics center needed to secure subsidies from the local government. She indicated that this could take a half year, and it layered in a bureaucratic approach to the sales process: "I want to move forward… We were building momentum, and this will slow the momentum down" (Interview, April 19, 2011). Despite some concerns, the extended timeline enabled John to make an argument internally and to stakeholders, that diversifying into running was a reinforcement of the original venture idea.

Relatedly, John complexified the *temporal ordering* of envisioned actions. Complexifying the temporal ordering refers to envisioning more actions with interdependencies among them. In this episode, the simultaneous development of systems for swimming and for

running created new interdependencies between actions. John envisioned the extension of some solutions under development for the swimming version to the running track version. Yet, he also wanted to develop solutions that would be applicable to both, and doing so was dependent upon the sales activities that he prioritized:

> *"If we start out with the running version I have the budget to do it, or to at least start with it. And if we can sell two or three systems that would be even better because then we are able to do it exactly like we want it right from the start."*
>
> (Interview, April 19, 2011)

Thus, sales of the running version were added as an immediate aim. This would then enable system development, and facilitate the subsequent development of solutions for both running and swimming versions (e.g. control systems) thereby creating more interdependent actions and milestones.

4.1.2. *Deferring: perseverance in response to problems*

Entrepreneurs also persevered when they encountered *problems* that threatened their initial ideas and challenged beliefs in the imagined opportunity (see Table 4). They could persevere by deferring if they were able to maintain relational commitments through adjusting temporal commitments. In the venture Security, for instance, the initial stakeholder commitments in 2007 included subsidies for funding specific technology developments and venture capital investments for setting up production facilities. As Nick, the CEO, explained:

> *"We are currently building a facility to mass produce the labels. We hope to produce the first batch by the end of the year. If all of that is successful, and a big pharma company decides to use our safety labels, then things can go really fast. We have leads, we have talked and they are interested in us. So, it is well possible that in a year we have full production."*
>
> (Magazine article, Summer 2007)

Subsequently, Security's founders confronted difficulties in meeting the milestones set by the venture capitalists, which impacted the venture's staged funding (Table 4, episode 10). Delays were caused by setbacks that the entrepreneurs experienced in developing the required technology, and in securing customer contracts. Despite these setbacks, however, the investors pressed the venture to persevere with its original idea, as Nick, one of the founders, explained: "They said: 'You need to focus, you need to focus'." (Interview, May 2012).

To accommodate the investors, Security's founders *positioned* their work as a continuation of the initial commitment they had made to solely focus on developing security labels for drugs:

> *"With the developed technology the three entrepreneurs would have been able to storm several markets—CD's, DVD's, cosmetics, cigarettes, brand clothing, et cetera—but they selected pharmacy. [Nick]: 'That's a choice, we have to focus.'"*
>
> (Magazine article, April 2008)

To maintain their commitments despite the delays, the founders had to extend the *temporal length* for meeting milestones: "The entire machine trajectory is postponed by half a year. It was our goal to have everything finished in July, but in July it was not at all

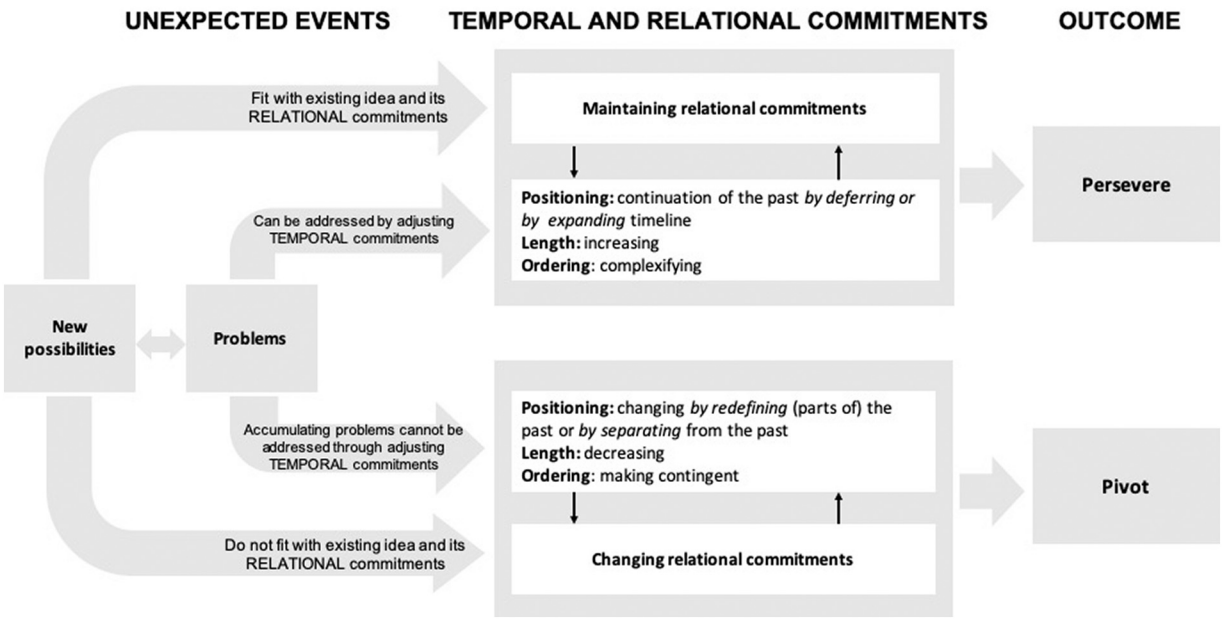

Fig. 1. Recalibration of temporal commitments in response to unexpected events leading to perseverance and pivots.

ready" (Interview, January 2009). A journalist explained:

> *"Despite the large number of potential clients, [Nick] experiences difficulties to get market share. … 'Due to the economic tide, we are still waiting for the realization of the contracts with big firms', [Nick] said."*
>
> (Newspaper article, November 2009)

The founders justified this deferral to their key stakeholders, including venture capitalists, by noting that the *temporal ordering* of the events on their communicated timeline was more complex than envisioned (in particular the interdependencies between technology development and sales):

> *"We are still negotiating with that customer. … We now do talk about prices and amounts, but I do not know when we can deliver, so they strike back. Of course, I keep asking things, but he responds: when can you deliver, and what are the risks? … So it is really hard to commit to new clients. In principle, I don't want to do that, so I try to delay that as far as possible. Till I know if everything is going well."*
>
> (Interview, November 2007)

4.1.3. Summary of temporal changes for perseverance

As these episodes from Digital Sports and Security show, entrepreneurs persevered when dealing with problems and new possibilities by adapting temporal commitments so that they could maintain and possibly extend relational commitments. These changes were similar across these episodes of perseverance, yet with nuances that depended upon whether venture ideas were adapted in response to new possibilities or problems (see also the other perseverance episodes in Table 4).

In adapting the temporal commitments for perseverance, entrepreneurs *temporally positioned* the venture idea in line with past actions, while focusing on the future, which was projected as a linear extension of the past. In response to problems that could be accommodated by adapting temporal commitments, the timeline was stretched rather than changed by *deferring* activities. In response to new possibilities that could fit in with the existing ideas, additional activities were added to the existing timeline. In all these episodes, the entrepreneurs emphasized that they were still on the same trajectory, stressing the feasibility of *expanding* the venture idea while maintaining prior commitments. For instance, MediCorp's Dan literally moved the timeline towards the future (see Table 4, episode 8): "In hindsight, it was too early to start a firm. …The animal test that we should have done a long time ago will only be done this and next month. In this respect, we started 2.5 years too early" (Interview, February 2007). The revised idea was *positioned* as an extension of a linear timeline.

To persevere, the *temporal length* of venture ideas was extended with new envisioned activities or by postponing activities in relation to problems and new possibilities. In response to new possibilities that fit in with the existing ideas and relational commitments, entrepreneurs positioned themselves on an extended timeline towards the future, which was a linear continuation of the past. In response to problems—regarding technology, offerings, customers, or partners—entrepreneurs deferred their existing timelines, preserving relational commitments by extending them into a more distant future. In MediCorp, for instance, the technical development of the medical device appeared to be difficult, so that Dan's expectations as well as the expectations of the stakeholders were not met. Citing setbacks in technology development and the characteristics of research, a final test was repeatedly postponed:

> *"It takes an incredible while, that's the most difficult part of entrepreneurship. Research always goes at a slower pace than expected and planned."*
>
> (*Magazine*, March 2007)

By adapting the temporal commitments, the structure of the initial idea was reinforced, but it was to be realized in an expanded way or at a later stage than initially imagined.

Closely related to extending the temporal length, the entrepreneurs complexified the envisioned *temporal ordering* of activities for perseverance. Such complexification was manifest in the addition of activities to the envisioned timeline along with justifications that the activities were more difficult than initially imagined and that there were interdependencies between activities.

4.2. Pivoting

Data analysis shows entrepreneurs pivoting when *new possibilities* did not fit in with the existing idea and associated relational commitments, or when *problems* could not be resolved by adjusting temporal commitments. Compared to perseverance, pivoting entails changes in both the temporal and relational commitments. The data show them *repositioning* the venture idea vis-à-vis the past, while explicitly relaxing or abandoning some relational commitments and maintaining others. By doing so, the entrepreneurs rewove the past into a new idea, and positioned themselves on a new timeline towards the future. Moreover, whereas episodes of perseverance showed an expanded or deferred future-oriented timeline, in the case of pivoting, attention shifted to the present, even as the entrepreneurs reworked past relational commitments. In most episodes, pivoting was enabled by a reduction of *temporal length* and the addition of contingencies to the *temporal ordering* of actions. We continue with an example of pivoting in response to new possibilities, and then an example of pivoting in response to mounting problems.

4.2.1. Redefining: pivoting when dealing with new possibilities

Entrepreneurs pivoted by redefining their ventures to act on *new possibilities* that did not fit in with the existing relational commitments they had made, and could not be incorporated through temporal adjustments. For instance, upon encountering new technologies, MediCorp added a water treatment product (Table 4, episode 1) and a product with new medical breathing technology (Table 4, episode 2) to its existing drug-delivery technology. Yet these additions did not fit in well with the initial existing products based on current technology, as the products served very different markets. Dan, the lead entrepreneur, also confronted commitments to several subsidy providers, inventors, medical specialists, and his employees. MediCorp had been given subsidies based on its medical device meeting the regulatory requirements and milestones. As Dan noted earlier (see Table 4, episode 8): "We have planned the long term goal of this project. We have determined milestones. We want market launch in six years, which implies that we need to start clinical Phase 1 in about two years." (Interview, April 2006).

Thus, relational commitments to funding agencies were associated with temporal commitments to specific milestones. These were eventually impossible to maintain because of unexpected delays in the development of the initial technology, and the multiple additional trajectories the firm began pursuing. To get to a new overall venture idea given expansions (Table 4, episode 12), Dan pivoted by redefining MediCorp as a 'holding' company in which past efforts would find different trajectories towards the future:

> *"MediCorp Group is the holding, and MediCorp and Watertreatment belong to this holding company. … It's a totally different market. … The main difference in this [Watertreatment] market is that as soon as we have a proven prototype, we can enter the market. For MediCorp we have to demonstrate the prototype, perform animal tests, maybe adjust the treatment, clinical trials, a number of years, adjustments, and only then we can enter the market. For Watertreatment, we are thus much closer to market launch, despite the fact that the technology is less developed."*
>
> (Interview, February 2007)

To temporally position these different technologies and products on a new timeline, Dan conceptualized the firm as an innovation funnel, in which each initiative is evaluated at a certain moment and next pushed forward or discontinued:

> *"I have built a firm that goes beyond a single idea. We have developed expertise, and want to use this expertise of course, also for different things. So, since the end of 2005, but mainly in 2006, we have set up the [innovation] funnel. And we evaluated everything. What is the feasibility; technical feasibility and economic feasibility? … These are the three criteria that we used to drop at least ten ideas."*
>
> (Interview, April 2012)

The positioning of MediCorp as a 'meta-structure' and the struggle for an overall venture identity is evidenced in Dan's email to a shareholder. Dan explained that the firm had several business cases rather than a single business. He also motivated this in a reflective interview: "At a certain moment, I started working with business cases because it is difficult to put Medicaid and Breathing in the same plan" (April 2012).

Thus, Dan espoused *temporal positioning* wherein past relational commitments lived on in a different way, while future commitments still remained open:

> *"Initially, our research focused on pain relief, but competitors entered that market. The same application can be used to treat bacterial infections. 'That idea really adds something, according to market parties. … A big multinational is interested in Watertreatment. Jointly we are setting up a big project for follow-up research'"*
>
> (Magazine article, 2009)

In the open nature of the future, the *temporal ordering* was contingent on the realization of projected activities for the different initiatives. Relatedly, the *temporal length* was rather undetermined and left without detailed new milestones. In sum, to pivot, entrepreneurs offered a revised understanding of the past, opened up new possibilities for the present, with a still open future that could be realized with subsequent actions.

4.2.2. Separating: pivoting in response to problems

Whereas MediCorp's episode describes a pivot to incorporate new possibilities, an episode from Digital Sports offers an example of pivoting in response to *problems* (Table 4, episode 21). Several problems built up over time at Digital Sports, which could not be addressed by adjusting temporal commitments. Technological problems with the swimming pool prototype emerged, causing delays, which were initially accommodated through changes in temporal commitments while maintaining relational commitments. In addition, there were problems with sales. While many swimming coaches from other countries were interested, their interest did not materialize into new contracts. Moreover, John continued postponing sales activities, noting that he "would do it next week". Consequently, sales possibilities remained as a plan for the future. Partially, he blamed such delays on technological setbacks, which translated to a lack of a fully functional prototype to show to prospective clients. Moreover, the decision-making process at potential client organizations proved to be more difficult than anticipated: *"What I thoroughly underestimated is the time needed between when the coach says 'OK, let's do it', and how much time it will take until you will actually have a signed order and a paid invoice. That is sometimes absolutely ridiculous."* Besides, John acknowledged that he lacked sales skills although he had always seen himself as "a commercial guy".

Whereas he had persevered with his venture idea in prior episodes, John pivoted this time as he found it difficult to address mounting problems. John's belief in the idea he had envisioned earlier began waning as his frustration mounted to a point that he decided to *separate* his venture idea from its past. In a meeting with venture stakeholders in December 2011, he noted:

> *"Yesterday we had like sort of a shareholder meeting. The way we are doing this company is one of the most complex things you can do. (…) We have to build everything from scratch and it is just utopist to think I can do it all by myself. Now, I have made a stand. I am not doing it further without a running mate or a companion entrepreneur, not just somebody who works for me but who is actively pulling the company forward."*
>
> (December 13, 2011)

This episode resulted in the addition of a running mate to the emerging company, a search for an investment partner with whom to target a broader market of consumers of sports products, and changing the focus of the venture idea: *"We decided to focus on running rather than swimming. It is the biggest market and the translation between the high-performance sports [and amateur sports] that will always be interesting."* (Interview, December 13, 2011). Simultaneously, Digital Sports decided that commitments to the existing stakeholders of the firm they were spun off from, were not extended, for instance by renegotiating their stakes in the venture.

This pivot was enabled by a change in *temporal positioning*. John had visualized the prior timeline as follows: after developing the first pacing system for swimming, he would continue with further development as his sales activities planned at major competitive swimming events in the Fall of 2010 would materialize. Perseverance in the face of sales problems and technical issues had extended this timeline, to the point that he was getting desperate about the time it would take. Commenting on the testing of water resistance he noted: *"The problem with that is there is only one way to really test years [resistance] under water, and that is years under water."* The revised timeline involved some of the elements, but dropped others. The stakeholders of the company they were spun off from were mostly concerned with developing the swimming version. Over time, as their involvement reduced, Digital Sports found itself with greater flexibility in orchestrating the temporal positioning of the venture idea.

Temporal ordering was made contingent on the outcome of subsequent actions. Specifically, the pursuit of Digital Sport's idea was left open by the entrepreneur, contingent upon finding an investment partner who could help the company gain a foothold in the consumer market: *"So what we are going to do is we are going to make a business plan to look for an investor or maybe a company that suits our vision and the way we approach things" (Interview, December 13, 2011)*. Similar contingencies were evident for dealing with the swimming version: *"I am not convinced anymore that if somebody wants to buy a swimming system … well I might take the order but I would never say that they would get it before next summer or something."*

Accordingly, the *temporal length* was reduced, with the entrepreneur's focus shifting to the present: *"The market needs maturing as well (…) There was a sort of inertia in the market. We said let's leave it for a while. Make the first one here in [name of city]. Let the engineers do their work, and we'll take it from there when this one is finished."* (April 17, 2012). In the short term, the entrepreneur's focus shifted to finding a partner to pivot to running and derivative consumer products, while de-emphasizing sales and development activities for the professional market. This did not imply that the longer term was deemed irrelevant. Rather, the focus had shifted to the short term to pivot, so that the timeline associated with the venture idea could extend again depending upon the outcomes of the short-term actions.

4.2.3. Summary of temporal changes for pivots

These episodes along with the others we analyzed (see Table 4) show entrepreneurs pivoting when new possibilities did not fit in with the relational commitments implicated in existing venture ideas, or when problems accumulated that could not be addressed any more by adjusting temporal commitments. These occasions frequently manifested themselves after entrepreneurs experienced prior episodes of perseverance. For instance, after prior expansion episodes, it was more difficult for entrepreneurs to introduce new possibilities into the venture idea. After prior deferring episodes, it was more difficult for entrepreneurs to address new problems by adjusting the temporal commitments.

Entrepreneurs enabled pivoting by *temporally repositioning* past elements in a new overarching idea, or by separating from the past. While the ventures maintained some relational commitments from the past, the entrepreneurs established a new venture identity, revised technological applications, and developed a fresh market focus. In the case of *new possibilities*, the entrepreneurs' timeline revived commitments established in the past, while in the case of *problems*, the entrepreneurs' timeline stressed separation from the past and present activities.

Further, whereas perseverance was characterized by an increase in the *temporal length* of the actions and milestones envisioned, pivoting involved a decrease in the temporal length, with entrepreneurs shifting their focus to the present. The episodes highlight how the accomplishment of a pivot involved a shift to short-term actions and new ways of building upon the commitments forged in the past. The *temporal ordering* of activities was made contingent on the outcomes of changes, thereby accommodating the new uncertainties that pivots implicate.

5. Discussion

We undertook this study to understand how time is implicated in entrepreneurs' efforts to persevere or pivot when they encounter unexpected events. Data analysis showed entrepreneurs persevering on a linear trajectory by extending the past, increasing the

temporal length between actions and milestones, and complexifying the envisioned temporal ordering. In contrast, entrepreneurs pivoted by revisiting the past and its connection to the present and the future, reducing the temporal length between actions and outcomes, and following a temporal ordering that was contingent on positive outcomes from the new path.

5.1. Implications for theory on entrepreneurial action

Our findings hold several implications for entrepreneurial action theory. First, we highlight the importance of considering temporal and relational commitments simultaneously to understand whether and how entrepreneurs pivot or persevere. Prior work has established the significant influence of relational commitments on decisions by entrepreneurs to persevere or pivot (Grimes, 2018; Hampel et al., 2020; McDonald and Gao, 2019; Zuzul and Tripsas, 2020). While corroborating these insights, our findings show that temporal commitments also must be considered to understand the responses of entrepreneurs to unexpected events.

We find that changing temporal commitments helps avoid more radical changes to relational commitments, which facilitates perseverance. Changing temporal commitments is often less disruptive than changing relational commitments as it concerns the 'when' of commitments, not the 'what'. Stakeholders often press for perseverance (Garud et al., 2014b), as we observed for instance with the venture capitalist in *Security* when the venture did not meet its projected milestones. Here, the entrepreneur needed more time to accommodate a more complex sequence of actions, but remained on the same overall timeline as agreed in the past. This implies that by reworking temporal commitments in an integrative way, entrepreneurs can maintain or expand relational commitments and thereby persevere. Changes in temporal commitments thus act as a buffer against the more complicated changes to relational commitments as documented by Grimes (2018), Hampel et al. (2020), McDonald and Gao (2019), and Zuzul and Tripsas (2020).

A different set of changes in temporal commitments may facilitate the adaptation of relational commitments to enable a pivot. It may not be possible to address problems as they accumulate by changing temporal commitments only, as the pivoting example of Digital Sports showed. An even longer and more complex timeline would have threatened the venture's prospects. Indeed, positioning the idea on a new timeline, with a revised interpretation of the past, and a contingent approach to the future helped forge a new identity and revise stakeholders' commitments. Similarly, acting upon new possibilities could conflict with existing relational commitments, and the extent to which they can be changed depends on reworking temporal commitments. Thus, we add to prior research on pivoting that documented the need for identity work (Grimes, 2018; Zuzul and Tripsas, 2020) and attention for stakeholder commitments (Hampel et al., 2020; McDonald and Gao, 2019), by showing how temporal commitments have to be calibrated and recalibrated along with relational commitments.

Moreover, insight into how temporal and relational commitments are intertwined also extends insights by Wood et al. (2021) who proposed that the temporal dimensions of venture ideas must be synchronized with customers and stakeholders to get their receptiveness. We developed this idea further by considering how temporal dimensions of ideas such as positioning, length and ordering get entangled with relational commitments. This connection becomes especially salient after initiation, when ventures confront challenges that lead to decisions about whether to persevere or pivot.

Second, we offer insight into the temporal calibration involved in pivoting and perseverance as distinctive modes of entrepreneurial action after initiation. As entrepreneurial action unfolds, entrepreneurs need to account for their past commitments and promised futures, particularly when the venture is disturbed by unforeseen events. Building on Wood et al. (2021), who considered the calibration of temporal dimensions for initial entrepreneurial action, we considered how temporal positioning, temporal length and temporal ordering must be recalibrated after initial action. We show how the recalibration of temporal commitments when entrepreneurs encounter unexpected events differs between pivoting and perseverance, and how both differ from temporal calibration for initial entrepreneurial action.

Our findings show *temporal positioning* taking on extended meaning after venture initiation. When starting a new venture, temporal positioning concerns the timing of initial action on a future timeline (Wood et al., 2021). In particular, when entrepreneurs perceive initial action as more immediate, they are more likely to get going. However, when entrepreneurial action is underway, entrepreneurs must position their activities along a timeline that includes actions and events that have unfolded in the past. Initial action thus becomes part of an organization's history. Entrepreneurs may redefine their timelines by linking actions and events from the past, present and future in new ways to craft a venture idea (e.g., Garud et al., 2018; Hjorth et al., 2015). Now, the decisive characteristic is no longer how imminent the moment of initial entrepreneurial activity is, but how entrepreneurial action can be made to fit in with what came before, and what may follow after.

To persevere, entrepreneurs position themselves on an existing timeline by emphasizing how they extended what they had initialized in the past (see also Hernes and Irgens, 2013). To pivot, entrepreneurs create a new timeline, 'reinitializing' the venture while reviving relevant relational commitments or reconciling commitments that were no longer relevant or feasible. These observations relate to work by Grimes et al. (2019) and McDonald and Gao (2019) who observed entrepreneurs 'abstracting' their narratives to redefine their venture ideas in response to new possibilities or separating ideas in response to problems.

With regard to *temporal length* (i.e., the initial milestones that define the pace of venture gestation), our findings have implications for how entrepreneurs adjust the "length of the runway" (Wood et al., 2019) depending on whether the entrepreneurs are persevering or pivoting in entrepreneurial action. To persevere, temporal length is expanded either by expanding the timeline, or by deferring milestones. Such efforts do not necessarily mean a decrease of pace as in the case of initial action. Extending the runway implies

additional activity, particularly in the case of perseverance though expansion. In the case of pivoting, temporal length typically decreases, centering on activities in the present. So, not only does limited time make pivoting more likely, as Wood et al. (2019) found in vignette experiments, but, in addition, our findings suggest that pivoting involves a shift of focus towards the present.

Similarly, *temporal ordering* becomes more complex in the case of perseverance, while in the case of pivoting it becomes contingent on the completion of projected actions and milestones. These findings provide nuance to Wood et al.'s (2021) conjecture that reinforcing sequences (e.g., complex but linear ordering) increase the likelihood of entrepreneurial action, while reactive sequences (e.g., contingent ordering of events) decrease entrepreneurial action. As our observations center on entrepreneurial action after initiation, we see that perseverance involves complexifying the ordering of events, which calls for a longer timeline than previously committed to. In contrast, pivoting involves 'reopening' the future by making prospective events contingent on the outcomes the pivot engenders.

Third, our findings inform a deeper understanding of pivoting and perseverance in response to different types of unexpected events. For the most part, prior research has argued for continuity in response to positive outcomes, and change in response to negative outcomes (Levitt and March, 1988; Wood and McKinley, 2017). In contrast, we also observed pivots in response to new possibilities and perseverance in response to problems, thereby corroborating insights offered by Kirtley and O'Mahony (2020). New possibilities that emerge — new technological solutions, suggestions for additional offerings, etcetera — may extend entrepreneurs' imagination of opportunities. The scope of the opportunity that is pursued might be extended, or, after a pivot, an entrepreneur may be pursuing a different opportunity altogether (cf. Ramoglou and Tsang, 2016).

Whether in response to problems or to new possibilities, perseverance was not just mere continuation nor the absence of any change — it also involved temporal work to effectively address problems and add new possibilities. In this regard, perseverance is related to the 'containing' discussed by Grimes et al. (2019). Although containment is primarily oriented towards incorporating negative experiences, we found that positive experiences could also lead to some form of containment through the expansion of the initial idea.

We found that for the entrepreneurs involved in this study, pivoting involved redefining their ventures and separating from the past relative to the changes specifically elicited by unfolding events that they could not integrate into the existing venture idea. Whereas Grimes (2018), Hampel et al. (2020) and McDonald and Gao (2019) focused on a single major pivot, we examined how entrepreneurs reworked their ideas in response to multiple unexpected events over time. In a similar vein, Kirtley and O'Mahony (2020) found that multiple strategic changes built up to a pivot. Thus, pivots may be triggered by prior episodes of perseverance.

5.2. Limitations and future research

The limitations of this study present an opportunity for conducting further research. First, we identified episodes through a longitudinal study involving interviews and a range of documents over time. This approach has the advantage of allowing researchers to compare the development of venture ideas. However, except for the accounts in the documents we gathered, we were unable to comprehensively cover entrepreneurs' idea pitches to stakeholders such as clients, employees, partners, and venture capitalists. Thus, an extension of this study would be to follow the entrepreneurs as they share their ideas with other stakeholders. That way, researchers could study whether accounts differ across stakeholders, and whether temporal commitments are highlighted in different ways. For example, is temporal positioning through reviving of the past less relevant in the interactions between entrepreneurs and new stakeholders?

Second, we studied episodes in technology-based ventures that were spin-offs. Studying multiple episodes in multiple ventures offers grounds for generalization to similar cases. However, an open question remains as to whether the findings from this study hold for different kinds of ventures in different contexts (see also Tsang and Williams, 2012). Technology-based ventures may experience more unexpected events than others because of the inherent uncertainties surrounding technological opportunities. Even with such ventures, growth may result in the institutionalization of venture ideas. Future research could compare the temporal and relational commitments of perseverance and pivoting in ventures that operate across different sectors.

6. Conclusion

Pivoting and perseverance involve a recalibration of a venture's temporal and relational commitments. Our findings demonstrate differences across the recalibration of temporal commitments for pivoting and perseverance. By introducing these findings, our study showcases the need to further investigate the relationship between the temporal and relational commitments in response to unexpected events.

CRediT authorship contribution statement

Hans Berends: Conceptualization, Methodology, Investigation, Formal Analysis, Writing – original draft; Writing – review & editing.

Elco van Burg: Conceptualization, Methodology, Investigation, Formal Analysis, Writing – original draft; Writing – review & editing.

Raghu Garud: Conceptualization, Methodology, Formal Analysis, Writing – original draft; Writing – review & editing.

Declaration of competing interest

None.

References

Alvarez, S.A., Barney, J.B., 2007. Discovery and creation: alternative theories of entrepreneurial action. Strateg. Entrep. J. 1, 11–26.
Alvarez, S.A., Young, S.L., Woolley, J.L., 2015. Opportunities and institutions: a co-creation story of the king crab industry. J. Bus. Ventur. 30, 95–112.
Andries, P., Debackere, K., 2006. Adaptation in new technology-based ventures: insights at the company level. Int. J. Manag. Rev. 8, 91–112.
Berends, H., Deken, F., 2021. Composing qualitative process research. Strateg. Organ. 19, 134–146.
Bird, B.J., West III, G.P., 1998. Time and entrepreneurship. Entrepreneurship Theory and Practice 22, 5–9.
Chiles, T.H., Elias, S.R.S.T.A., Li, Q., 2017. Entrepreneurship as process. In: Langley, A., Tsoukas, H. (Eds.), The Sage Handbook of Process Organization Studies. Sage, London, pp. 432–450.
Crilly, N., 2018. 'Fixation' and 'the pivot': balancing persistence with flexibility in design and entrepreneurship. International Journal of Design Creativity and Innovation 6, 52–65.
Davidsson, P., 2015. Entrepreneurial opportunities and the entrepreneurship nexus: a re-conceptualization. J. Bus. Ventur. 30, 674–695.
Evered, R., Louis, M.R., 1981. Alternative perspectives in the organizational sciences: "inquiry from the inside" and "inquiry from the outside". Acad. Manag. Rev. 6, 385–395.
Farmer, S.M., Yao, X., Kung–Mcintyre, K., 2011. The behavioral impact of entrepreneur identity aspiration and prior entrepreneurial experience. Entrepreneurship Theory and Practice 35, 245–273.
Fisher, G., Aguinis, H., 2017. Using theory elaboration to make theoretical advancements. Organ. Res. Methods 20, 438–464.
Garud, R., Gehman, J., Giuliani, A.P., 2014a. Contextualizing entrepreneurial innovation: a narrative perspective. Res. Policy 43, 1177–1188.
Garud, R., Schildt, H., Lant, T., 2014b. Entrepreneurial storytelling, future expectations, and the paradox of legitimacy. Organ. Sci. 25, 1479–1492.
Garud, R., Gehman, J., Giuliani, A.P., 2018. Why not take a performative approach to entrepreneurship? J. Bus. Ventur. Insights 9, 60–64.
Garud, R., Kumaraswamy, A. Roberts, A. and Xu, L. (2020). Liminal movement by platform-based sharing-economy ventures: The case of Uber technologies. Strategic Management Journal. Advance online publication, doi.org/10.1002/smj.3148.
Grimes, M., 2018. The pivot: how founders respond to feedback through idea and identify work. Acad. Manag. J. 61, 1692–1717.
Grimes, M., Williams, T.A., Zhao, E.Y., 2019. Anchors aweigh: the sources, variety, and challenges of mission drift. Acad. Manag. Rev. 44, 800–818.
Hampel, C.E., Tracey, P., Weber, K., 2020. The art of the pivot: how new ventures manage identification relationships with stakeholders as they change direction. Acad. Manag. J. 63, 440–471.
Hernes, T., Irgens, E.J., 2013. Keeping things mindfully on track: organizational learning under continuity. Manag. Learn. 44, 253–266.
Hjorth, D., Holt, R., Steyaert, C., 2015. Entrepreneurship and process studies. Int. Small Bus. J. 33, 599–611.
Jick, T.D., 1979. Mixing qualitative and quantitative methods: triangulation in action. Adm. Sci. Q. 24, 602–611.
Kirtley, J., and O'Mahony, S. (2020). What is a pivot? Explaining when and how entrepreneurial firms decide to make strategic change and pivot. Strategic Management Journal. Advance online publication, doi.org/10.1002/smj.3131.
Langley, A., 1999. Strategies for theorizing from process data. Acad. Manag. Rev. 24, 691–710.
Lévesque, M., Stephan, U., 2020. It's time we talk about time in entrepreneurship. Entrepreneurship Theory and Practice 44, 163–184.
Levitt, B., March, J.G., 1988. Organizational learning. Annu. Rev. Sociol. 14, 319–340.
Lok, J., de Rond, M., 2013. On the plasticity of institutions: containing and restoring practice breakdowns at the Cambridge University Boat Club. Acad. Manag. J. 56, 185–207.
Lounsbury, M., Glynn, M.A., 2001. Cultural entrepreneurship: stories, legitimacy, and the acquisition of resources. Strateg. Manag. J. 22, 545–564.
Manning, S., Bejarano, T., 2016. Convincing the crowd: entrepreneurial storytelling in crowdfunding campaigns. Strateg. Organ. 15, 194–219.
McDonald, R., Gao, C., 2019. Pivoting isn't enough? Managing strategic reorientation in new ventures. Organ. Sci. 30, 1125–1393.
McMullen, J.S., 2017. Are you pivoting away your passion? The hidden danger of assuming customer sovereignty in entrepreneurial value creation. Business Horizons 60, 427–430.
McMullen, J.S., Dimov, D., 2013. Time and the entrepreneurial journey: the problems and promise of studying entrepreneurship as a process. J. Manag. Stud. 50, 1481–1512.
McMullen, J.S., Shepherd, D.A., 2006. Entrepreneurial action and the role of uncertainty in the theory of the entrepreneur. Acad. Manag. Rev. 31, 132–152.
Miles, M.B., Huberman, A.M., Saldaña, J., 2014. Qualitative Data Analysis: A Methods Sourcebook. Sage Publications, Thousand Oaks, CA.
Mitchell, J.R., Shepherd, D.A., 2010. To thine own self be true: images of self, images of opportunity, and entrepreneurial action. J. Bus. Ventur. 25, 138–154.
Morgeson, F.P., Mitchell, T.R., Liu, D., 2015. Event system theory: an event-oriented approach to the organizational sciences. Acad. Manag. Rev. 40, 515–537.
Patton, M.Q., 2002. Qualitative Research and Evaluation Methods. Sage Publications, Thousand Oaks, CA.
Ramoglou, S., Tsang, E.W., 2016. A realist perspective of entrepreneurship: opportunities as propensities. Acad. Manag. Rev. 41, 410–434.
Ramoglou, S., Tsang, E.W.K., 2017. Accepting the unknowables of entrepreneurship and overcoming philosophical obstacles to scientific progress. J. Bus. Ventur. Insights 8, 71–77.
Reymen, I.M.M.J., Andries, P., Berends, H., Mauer, R., Stephan, U., Van Burg, E., 2015. Understanding dynamics of strategic decision making in venture creation: a process study of effectuation and causation. Strateg. Entrep. J. 9, 351–379.
Ries, E., 2011. The Lean Startup: How today's Entrepreneurs Use Continuous Innovation to Create Radically Successful Businesses. Crown Business, New York.
Shepherd, D.A., Haynie, J.M., McMullen, J.S., 2012. Confirmatory search as a useful heuristic? Testing the veracity of entrepreneurial conjectures. J. Bus. Ventur. 27, 637–651.
Snihur, Y., Reiche, B.S., Quintane, E., 2017. Sustaining actor engagement during the opportunity development process. Strateg. Entrep. J. 11, 1–17.
Steffensen, M., Rogers, E.M., Speakman, K., 2000. Spin-offs from research centers at a research university. J. Bus. Ventur. 15, 93–111.
Sternberg, R., 2014. Success factors of university-spin-offs: regional government support programs versus regional environment. Technovation 34, 137–148.
Strauss, A., Corbin, J., 1998. Basics of Qualitative Research: Techniques and Procedures for Developing Grounded Theory (Vol. 2nd). Sage Publications, Thousand Oaks, CA.
Tsang, E.W., Williams, J.N., 2012. Generalization and induction: misconceptions, clarifications, and a classification of induction. MIS Q. 36, 729–748.
Van de Ven, A.H., Polley, D.E., Garud, R., Venkataraman, S., 1999. The Innovation Journey. Oxford University Press, Oxford.
Wadhwani, R.D., Kirsch, D., Welter, F., Gartner, W.B., Jones, G.G., 2020. Context, time, and change: historical approaches to entrepreneurship research. Strateg. Entrep. J. 14, 3–19.
Wood, M.S., McKinley, W., 2017. After the venture: the reproduction and destruction of entrepreneurial opportunity. Strateg. Entrep. J. 11, 18–35.
Wood, M.S., McKinley, W., 2020. The entrepreneurial opportunity construct: dislodge or leverage? Acad. Manag. Perspect. 34, 352–365.
Wood, M.S., McKelvie, A., Haynie, J.M., 2014. Making it personal: opportunity individuation and the shaping of opportunity beliefs. J. Bus. Ventur. 29, 252–272.

Wood, M.S., Palich, L.E., Browder, R.E., 2019. Full steam ahead or abandon ship? An empirical investigation of complete pivot decisions. J. Small Bus. Manag. 57, 1637–1660.
Wood, M.S., Bakker, R., Fisher, G., 2021. Back to the future: a time-calibrated theory of entrepreneurial action. Acad. Manag. Rev. 46, 147–171.
Younger, S., Fisher, G., 2020. The exemplar enigma: new venture image formation in an emergent organizational category. J. Bus. Ventur. 35, 105897.
Zuzul, T., Tripsas, M., 2020. Start-up inertia versus flexibility: the role of founder identity in a nascent industry. Adm. Sci. Q. 65, 395–433.